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The Cost of Producing Market Milk and Butterfat on 246 California Dairies

BY
R. L. ADAMS

Pieterje Bloom Mead, producer of 1004.4 pounds of butterfat and 28,235.8 pounds of milk.

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PART I. INTRODUCTION

MOTIVE FOR THE STUDY

During the fall of 1921, the College of Agriculture, through its Division of Farm Management, undertook the task of determining the cost of producing whole milk and butterfat on representative dairies in the more important commercial dairying sections of the state. This publication is the result of the findings obtained from 14,250 cows on 246 dairies situated in eleven dairying sections. Record taking covered an entire year's business on each dairy. Most of the records were taken for the year between March 1, 1922, and March 1, 1923. A few were under observation for the year ending November 1, 1922, a number were concluded January 1, 1923, and a very few ended April 1, 1923. All results, however, are comparable because no unusual condition tended to vary the results during the entire period from November 1, 1921, to April 1, 1923.

Studies were initiated on a total of 353 dairies, but, for various reasons, a considerable number were eliminated either during the period of record taking or in the final analysis. Some dairies were closed out, the owners going into other lines; some were sold; in a few cases inability to secure proper coöperation eliminated some, including two or three dairying sections which would otherwise have been included. Dairies producing certified milk were eliminated, thus confining this presentation to dairies strictly concerned with the production of whole milk or butterfat of ordinary commercial grades.

TERRITORIES STUDIED

Typical commercial dairying centers were selected for study in the territory from San Diego County on the south to Humboldt County on the north. The 1920 Census Report of dairy cows was made the basis for selection. Eleven districts were studied, these being:

1. The central and northern parts of Humboldt County and the southern part of Del Norte County.

2. The western portions of Marin and Sonoma counties.

3. San Francisco Bay section comprising dairies in Contra Costa, Alameda, and Santa Clara counties

4. Sacramento and Yolo counties grouped together.

5. Southern San Joaquin and northern Stanislaus counties considered as a single district.

6. Southern Fresno and northern Kings counties grouped together.

7. The territories surrounding Bakersfield, Delano, McFarland, and Wasco in Kern County handled as a single unit.

8. Los Angeles and Orange counties handled jointly as typical of southern California conditions.

9. Certain valleys tributary to and supplying the city of San Diego in San Diego County.

10. The area around the towns of Harmony, Cambria and Cayucos in San Luis Obispo County.

11. Dairying districts in Monterey, San Benito and Santa Cruz counties which because of similar conditions could be grouped together.

The accompanying sketch map indicates at a glance the location of these various districts within the state's boundaries.

Attempts to include other sections, notably Imperial Valley, Merced County, Glenn County, and Butte County, failed because of either a lack of interest on the part of the dairymen from whom the data had to be obtained, or inability to secure satisfactory local assistance in record taking.

In the following pages, each of the eleven districts is handled separately.

METHOD OF COLLECTING THE DATA

Care was exercised in selection to secure so far as possible representative dairies which, grouped together, would constitute a cross-section of the industry as a whole within the particular community. If small dairies were the rule, with only a sprinkling of large dairies, those selected for study were prorated in accordance with the situation as affecting the total number of dairies. If large dairies were the rule, care was used to include in the studies a proper proportion of large dairies in the number finally selected. In the same way, an attempt was made to have good representation of the character of dairies and nationality of dairymen, in accordance with the general situation. It is believed that the findings are sufficiently typical of the districts so that though the number of dairies may be small, yet they constitute a reliable index.

Record-taking consisted of two inventories, one at the beginning and the other at the end of the year covered by the study, and twelve monthly reports of operating details.

The first inventory reported the method of handling the dairy; method of breeding; times of milking; use of by-products; nationality of dairymen and milkers; farm data covering the total acreage used in dairying and its character; the number of acres of pasture with details as to carrying capacity and values; herd data showing the number, age, condition of the herd, and average length of lactation period; a detailed report for each building and structure used in

Fig. 1.

1. Humboldt & Del Norte Counties
2. Western Marin & Sonoma Counties
3. Contra Costa, Alameda, & Santa Clara Counties
4. Sacramento & Yolo Counties
5. Southern San Joaquin & Northern Stanislaus Counties
6. Fresno County
7. Kern County (vicinity of Bakersfield)
8. Los Angeles & Orange Counties
9. San Diego County
10. San Luis Obispo County
11. Monterey, San Benito & Santa Cruz Counties.

Fig. 1. Location of areas where cost of milk production studies were carried on.

connection with the dairy; a full list of dairy equipment; an estimate of operating capital deemed necessary to meet expenses; the amount of reserve necessary to tide the business over times of business depression, accident, disease, market slumps; and finally, data concerning the management charge for dairies handled by paid managers.

The second inventory was largely a repetition of the items appearing in the first inventory to secure data concerning herds, buildings, dairy equipment, pasture insurance, and tax charges.

The monthly reports covered, for each calendar month, changes in the milking herd; amount of labor expended including rate of payment and average length of work-day; horse labor; automobile or truck utilized for the dairy; cost of contract hauling of milk; amounts, kind and farm value of both home-grown and purchased feeds used during the month; determination of feed and labor costs in connection with the keeping of bulls; expenditures for new equipment such as cans, separators, milk pails; expenditures for the upkeep of buildings—both materials and labor; payments for insurance and taxes; outlay for supplies such as salt, spray material, washing powder, stock medicine, gasoline, and separator or milking machine parts; rental payments; receipts from sales of milk, cream, butterfat, skimmilk, cows or bulls from milking herd, unweaned calves, hides, manure; and minor miscellaneous items such as feed bags, boarding cows pending breeding, stock killed accidentally, bull service; statement of home or ranch use of milk, cream, skimmilk, and manure; statement of the value of calves weaned during the month and of sales of weaned young stock.

Supplementary records were also taken of data necessary to properly determine the correct charge for horse labor, trucks, and automobiles used in connection with the dairy.

The collection of data was obtained by three men employed solely for the purpose of helping in this investigation, supplemented by the efforts of a number of collaborators who were employed on part time to assist in rounding out the collection of information. The personnel of the collaborators consisted of ten men employed primarily at cow testing, four high school teachers, one dairy inspector, one creamery operator, and one man primarily engaged in general farming.

ITEMS DETERMINING COSTS

The summary tables presented in connection with the details of each district set forth the various costs which, together, make up the gross cost of producing whole milk or butterfat or both, from which are then deducted credits for calves, manure, skimmilk, or any other item that should be deducted to determine the net cost. Both direct and indirect costs are included. Direct costs are made up of actual expenditures for labor, feed, hauling, and supplies. The indirect costs consists of interest on operating capital, herd charge, bull charge, building charge, corral charge, and equipment charge.

MANNER OF ASSEMBLING DATA

In collecting the data, attention was confined to the milking herd, all other operations being ignored. Thus, the raising of crops, of hogs, of young cattle, or similar activities were ignored as not being primarily a phase of the dairying business. Calves were credited to the dairy at their value when four or five days old, from then on any increase in value being deemed part of the young stock operations rather than pertaining to the dairy itself.

Man Labor.—Man labor was studied in hours spent in manual labor in handling the dairy at the going wage, including the value of board and other perquisites. Management was determined by estimating the amount of time spent by the operator in purely managerial details at the going salary scale for operating a similar business or at the actual rate paid if the operator were receiving a salary.

Horse Labor.—The cost of horse labor was determined from the following items which enter into this charge: Feed; depreciation on horses, horse equipment, and barns; mortality of horses; upkeep of equipment and barns; miscellaneous items such as shoeing and veterinary; labor of feeding and grooming; and interest at 6 per cent on the investment in horses and horse equipment. From the sum of these items any credits for foals or rentals were made. The net cost of keeping a horse was then divided by the estimated number of hours used a year to obtain the hour cost, and the proper charge made against the dairy for all horse labor there used.

Use of Trucks and Automobiles.—The charge for the use of trucks and automobiles was determined by finding out the total mile charge for all work done by such equipment and then pro-rating against

the dairy its proportion based on the number of miles used solely for dairy purposes. This charge was made up of depreciation, interest, insurance, taxes, and yearly repairs, depreciation based on the original cost and estimated life of the vehicle, and interest on the average value during the year involved. To this figure was then added operating costs for gasoline, oil, tires, and tubes.

Feeds.—To eliminate the necessity of becoming involved in land values, all feeds contributed by the ranch—whether pasture, hay, concentrates, or others, were charged at farm value, i.e., market value less cost of preparing for sale and delivering. Purchased feeds were figured at cost delivered to the dairy.

Hauling.—The hauling charge, if done by the ranch, was covered under labor, but if paid in cash for contract hauling was taken at the actual sum spent. On some dairies, both ranch hauling and contract hauling charges were encountered.

Miscellaneous Items.—This classification is primarily concerned with the cost of supplies such as washing powder, gasoline, oil, fuel, separator and milking machine parts, veterinary supplies and similar items.

Insurance.—Insurance when encountered is made up of the actual yearly premiums paid by the dairymen for insuring cattle, buildings, equipment, feed, or the carrying of workmen's compensation liability. The amount in each instance is entered under the proper heading.

Taxes.—The sums which were actually expended by the dairymen for taxes for the year involved in the study were obtained from the assessors' books in the respective county seats, or from the books in the City Hall if the dairy happened to be within the confines of an incorporated town. Taxes were encountered in connection with the dairy herds, dairy buildings, dairying equipment, and in getting at the right charge for horse and mechanical labor. In determining the building tax, an estimate had to be made because most assessors' books gave a single figure for all buildings without segregating according to use. In such cases, it was necessary to estimate the percentage of the total sum chargeable against the dairy.

Investments.—Capital invested in herds, dairy buildings, dairy equipment, and improvements in connection with the corrals and stock quarters, such as fences, feed racks, water troughs, shelters, flooring, etc., was handled as an investment. Lands used for pasturage or for the production of feed were not included under investment. Since productive land values are difficult to determine, no land investments were taken into account other than those in corrals, lanes, building

sites, feed lots, and those occupied by stock water facilities. Lands used for producing feed for the dairy were allowed a proper sum based on the going rate for pasture, and the farm value for all hay, grain, or other feeds produced, as discussed under feed above. This method eliminated danger of over-valuing lands, or inclusion of land values on a scale of suburban prices rather than upon strictly agricultural productive values.

The value of the feeds produced, taken at farm prices, from the dairying standpoint at least, automatically determines the land value.

The investment charge for lands in corrals, lanes, etc., was made up of the crop rental value for such lands. The reason for this is obvious. If lands regularly rent for $25, $30, or $40 for agricultural purposes, yet have a market value of $1000 or $1500 per acre, interest at 6 per cent, if taken at the market value, would result in an inordinately high charge of $60 to $90 instead of the actual payments of less than half as much.

In the event that new investments were made during the year, such investments were taken into account in accordance with the length of time that they were in use during the period covered by this study and pro-rated accordingly.

Interest Charges.—Interest was allowed upon all investments entering into the dairy business, as outlined in the preceding paragraph. Interest was charged against the average investments in dairy cattle, in buildings, in corral improvements and in dairying equipment, as shown by the data set forth in the two inventories. Interest was also charged upon sums needed for operating capital required to meet current expenses.

The amount of herd investment upon which interest was charged was made up of the average number of cows and bulls maintained throughout the year at average values shown by the first and second inventories. This figure therefore reflects any changes in values from such causes as fluctuating markets, selling off of old cows, purchase of better stock, introduction of young heifers or any changes affecting the selling value of the herd.

Interest Rate.—In all instances, interest has been charged at the flat rate of 6 per cent. While safe investments may be considered to average but 4, 4¼, 4½, or some percentage close to these, yet capital utilized for farming, whether for investment or in operating expense is subject to certain risks, of which climatic changes in connection with feed production, danger of accident, possibilities of disease, fire, inadequate transportation, insufficient labor, unforeseen

drops in market prices, are examples. Because of these risks, a higher rate is justified. The argument is recognized that farmers generally are not financiers and if compelled to reinvest their funds in some line other than farming would have to be content with savings bank or government bond rates. Such argument ignores possible investment in municipal or industrial stocks and bonds which may pay as high as 7 to 8 per cent. The rate of interest paid for the use of money borrowed for farming purposes is sometimes advanced as the proper basis for determining the rate that a farmer should secure, but earnings from such loans are not always net to the loaner because of costs of placing and collecting, occasional bad loans, lapses in interest payments, and taxes upon incomes. All things considered a rate of 6 per cent was deemed fair. However, if exception be taken to the use of this particular rate, it may be pointed out that sufficient detail in the tables will permit the reworking with any other rate.

Depreciation.—Ageing of cattle, wearing out of buildings and of equipment, with attendant exhaustion of capital invested therein are taken care of by depreciation. In some cases appreciation, or an actual gain in values during the year, occurred.

Depreciation was taken into account in connection with the dairy herds, the buildings, the improvements of the land set aside for corrals and stock quarters, the dairying equipment, and in connection with the estimate of the costs of horse labor and use of automobiles and trucks.

In the event that additional investments in buildings, equipment, or corral and stock quarters improvements were made during the year the amount of depreciation was pro-rated in accordance with the length of time used.

Figures for depreciation of buildings and equipment were determined from the dairyman's estimates of the probable life of the item involved divided into its first cost.

Depreciation of dairy herds was determined separately for cows and bulls. Values were placed by their owners upon the animals at the time when the first inventory was taken. The value of the herds to the dairymen when the second inventory was taken was again determined, valuations being then made on the basis of any increase or decrease in the value to the dairy of the individual animals irrespective of market changes. The figures of depreciation were determined by finding the difference between the sum of the animals at the time of taking the first inventory to which was added the value (at the time of placing) of any additional animals placed in the

herd during the year. From this total was then deducted the value of the herd on the basis of the second inventory figures, to which were added any returns from sales of herd cattle, values of animals dying, receipts from sales of hides, and amount of damages recovered for animals accidentally killed. In a number of herds, an appreciation rather than a depreciation of values occurred. This method took into account disposal of old or poor stock, and, as well, increase in values of purchased cattle or home-grown heifers placed in the milking herd.

Mortality in Herd.—All deaths occurring in the milking herd, of both cows and bulls, were taken at the values placed upon them at the time the loss occurred. If accidentally killed so that insurance or accident returns were obtained, the amount thus secured was credited to the herd and the net loss only taken into account.

Upkeep.—All moneys spent in upkeep of buildings, dairy house equipment, or corrals and stock quarters by the individual dairies studied in a given area were recorded and the total charged as an item of cost against the year's business of the group. For individual dairies, a figure was used which represented the average expenditures per $100 of investment for the group in determining upkeep charges for buildings and corrals together with their improvements. This method does not show variations between individual dairies but the item is of small size and relatively not important. In figuring upkeep of equipment, the actual sum expended by the individual dairy was included in arriving at the cost, since expenditure for upkeep is here largely a matter of replacing parts and making repairs, investment remaining practically the same.

Credits.—From the gross cost as determined by summing up the various items—operating, investment, and overhead—were then deducted certain credits. These consisted of calves, skimmilk when butterfat sold as cream was the principal product, and manure.

Calves.—The calves were credited to the dairy herd at a per head value when four or five days old, or at the time when the milk could be used for human consumption. The values for calves were very variable, depending on the local demand, the desirability of raising heifer calves for later incorporation in the milking herd, the breed, the possibility of saving bull calves for sires, and the pureness of the breeding. The values covered only calves that lived beyond the colostrum period, but took into account all kept, whether for future vealing or for weaning. Once the price was set for the calves, no further account was taken of them in so far as the dairy was concerned, although some study was made of the relative profitableness

of raising to the vealing or weaning stage, with milk taken at going prices, and the value of the marketable calf then compared with prices which could be obtained.

Skimmilk.—When the output of the dairies under observation was sold as whole milk, no credit was obtainable for skimmilk, but if butterfat was sold as cream then the amount of skimmilk was deemed a credit even though no actual use was made of it. In the case of districts selling butterfat, all whole milk used in the home or on the ranch was considered in terms of butterfat and skimmilk, the butterfat being added to the totals sold from the district as shown by the sales, and the skimmilk credited in full. When cream was sold, only the portion recovered by the separating was credited, no allowance being made for the skimmilk shipped with the butterfat to make up the usual consistency of cream. Dairymen's estimates of the value to them of any skimmilk produced were used in obtaining weighted averages of the credit to be allowed in a given community.

Manure.—Manure credits were allowed both on the sales and ranch use of the output from the dairy. In every instance the dairyman was asked to place a value on the output. As a result, in the case of some dairymen, particularly tenant farmers or operators possessing unusually rich land with no outside market for manure, the credit was small or nothing. In most cases dairymen were loath to place any estimate on the field droppings although most men believed that there was some material credit. Hence in most cases values are applicable mostly to corral accumulations. If a market exists, as is outstandingly the case in southern California, then the credit is a substantial item. If the field accumulations were added the total would undoubtedly be greater than the figure finally obtained.

Net Cost.—The net cost is the result obtained after deducting the total value of the credits from the gross cost as made up from the various items discussed above. In subsequent pages the costs for the different districts have been analyzed to show the cost per cow for the various factors involved in getting at both gross and net costs.

Production.—In each district both total production and average production per cow per year were determined. Total production, reported either as butterfat or whole milk, depending on the method of selling, was then converted for all dairies in terms of butterfat and whole milk for districts selling both products. Commonly in every district some butterfat was sold as cream during times of overproduction even though whole milk selling was the rule, while in butterfat producing areas, sales of whole milk were occasionally reported,

particularly if cheese making was practiced. In converting, full credit for all available skimmilk was given.

Total production was finally reported in the summary tables for each of the districts according to the usual kind of product disposed of. Thus in Marin and Sonoma counties and in San Luis Obispo County the selling of butterfat as cream was the rule, in Los Angeles and Orange counties the great bulk of the output, in fact practically all, was sold as whole milk but upon a butterfat content basis. In Kern County sales were well distributed between whole milk and butterfat in cream and the production was reported in terms of both.

The average production-per-cow figures are indicative rather than absolute. They were obtained by dividing the total yearly production, both for the individual dairies and for the district as a whole, by the average number of cows handled during the twelve-month period. Hence these figures may not check with the cow-testing records as they are subject to some variation because all producing animals were taken into account including springing heifers, old cows sold off during the milking period, and other factors. The data are, however, comparable within the scope of this publication, and are valuable for the possible changes that they suggest, as set forth, later on, under the section dealing with ways of increasing dairy profits.

Prices Received for Dairy Products.—Whenever prices are mentioned to show the returns received by dairymen, the figures were obtained by adding up the total receipts from sales at point of delivery by the producer including hauling charges for all the dairies studied in a given section and dividing by the amount of product sold. Price figures, therefore, apply only to the daries involved in the investigations, and, though indicative, may not be absolute guides to the situation in the entire community. They are based, too, on total sales, including surplus cream or milk, low grade output, and similar conditions which reduce prices otherwise obtainable. But the figures possess the advantage of being a mirror of the actual, existing conditions obtaining throughout the year covered by the study in each of the eleven sections where extensive collections of data took place.

MANNER OF PRESENTING THE FINDINGS

The findings of the investigation are set forth in Parts II, III, and IV which follow. Part II records the actual costs of producing whole milk and butterfat in the eleven districts, each presented complete in itself, during the calendar year involved in the study, with certain pertinent details from tables prepared to show the status of each individual dairy in the district. Part III sets forth the unit factors involved in the costs as found, and constitutes a ground plan for determining future dairy costs as long as dairying practice remains the same in a given community. Part IV is an outgrowth of the study in that it offers suggestive ways by which individual dairymen may increase their profits by proper use of means already at hand.

Of the three parts, Part II is perhaps of least permanent value, though basic to all the rest of the publication. Part III, with its attempts to set forth formulae for future use, is likely to be of more lasting value, while Part IV should prove of worth to all dairymen, in once more stressing the importance of individual attention to one's own business and the excellent chances for improvement which lie within the power of the individual himself.

From a perusal of the contents two personal phases should stand forth, first, the part that the individual can play in working out his own business destiny, and second, the opportunity for constructive coöperation between dairymen and others.

INDIVIDUAL DAIRY FINDINGS

To show something of the wide variation existing in the different dairies selected from any section a table has been prepared and inserted under each district heading, giving in detail the amount of the different items involved in determining the cost of milk and butterfat production.

For ease in comparing the findings of one district with another, and to better indicate the production which must be expected per cow in order to justify dairying under conditions as practiced in a given section in connection with costs and receipts as of 1922, this table contains a column setting forth the average costs per cow for all cows coming under observation.

PART II. COSTS OF PRODUCING WHOLE MILK AND BUTTERFAT

This part of the report sets forth findings concerning actual costs incurred in producing whole milk or butterfat on 246 dairies studied for the purpose of securing basic data. The results cover eleven districts, each district being discussed individually in the following pages.

In all 14,250 cows were covered by the study, these being located as follows:

District	Number of Dairies	Number of Cows
Humboldt–Del Norte	25	890
Marin–Sonoma	19	996
Alameda, Contra Costa and Santa Clara	20	2,782
Sacramento–Yolo	41	2,912
San Joaquin–Stanislaus	17	417
Fresno	17	767
Kern	15	599
Los Angeles–Orange	40	2,242
San Diego	13	583
San Luis Obispo	20	1,329
Monterey, San Benito and Santa Cruz	19	733
Totals	246	14,250

1. HUMBOLDT–DEL NORTE DISTRICT

Brief Description of Area

A year's study was successfully completed on 25 dairies in this district, 13 of these being in the Arcata bottoms and 12 on cleared redwoods lands in the Orick-Requa district. The original plan of study provided for the collection of data from the Ferndale-Loleta area but though the work was started it came to an early end for lack of facilities to carry on record taking. It is unfortunate that this latter district is not included because it constitutes perhaps the best known dairying community of the Humboldt-Del Norte area. For purposes of comparison and record the findings for the two localities have been kept separate. Although operating under somewhat similar conditions dairying in the Arcata district is conducted on bottom lands, while the industry in the Orick-Requa district is on reclaimed forest lands. Of the 13 dairies in the Arcata district 12

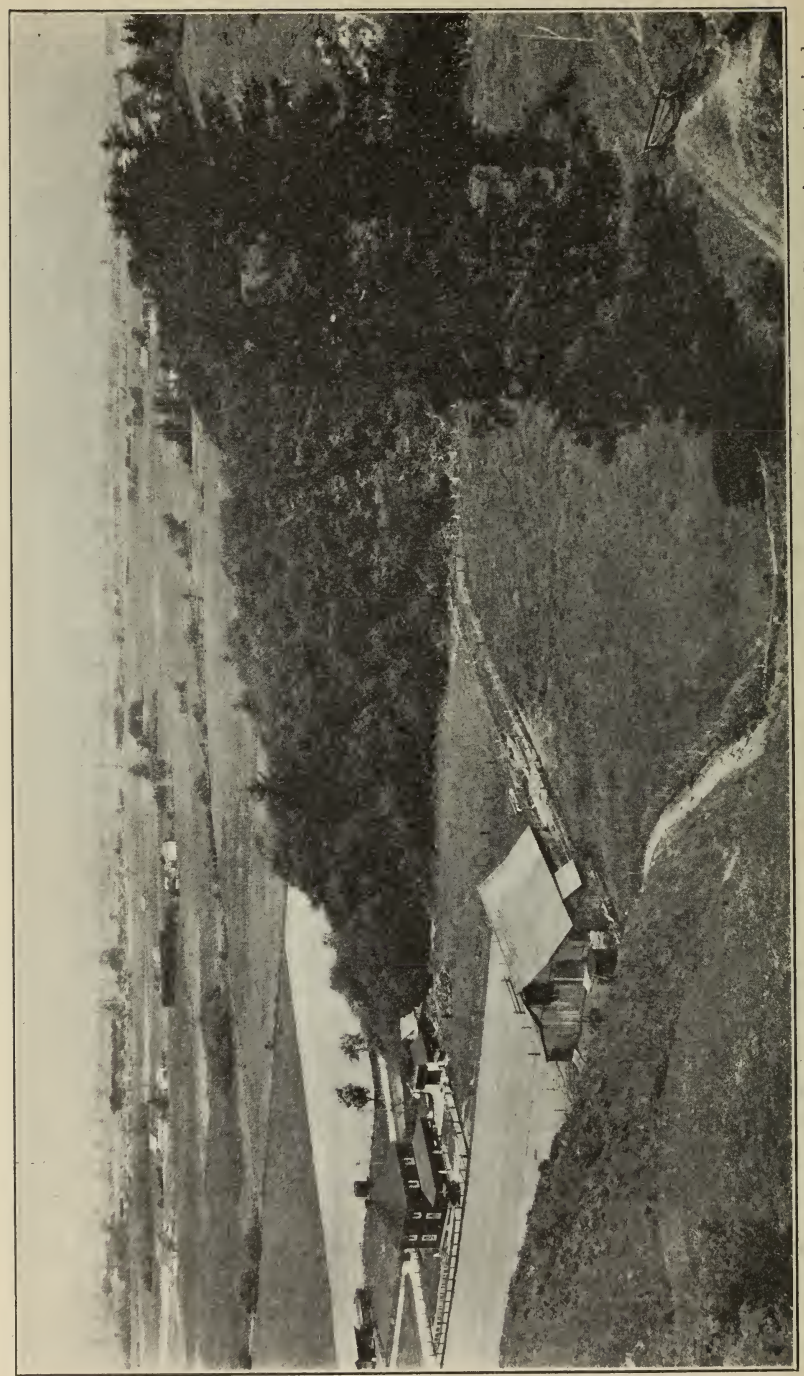

Fig. 2.—Bottom lands utilized by dairies of Humboldt County, showing farm layout and dairy building equipment typical of the Arcata District.

were contributory to Arcata and one to Fieldbrook. In the Orick-Requa section 6 dairies were contributory to Requa and 6 to Orick. In general these dairies reflect conditions in central and northern Humboldt County and in Del Norte County.

The record taking in all cases covered the year from March 1, 1922, to March 1, 1923.

The Arcata dairies utilized 1256 acres of land, ranging in size from 40 to 250 acres. The land was principally bottom land with a little additional rolling and brush covered hills. These lands were utilized for pasture and for crop production.

The Orick-Requa dairies utilized 1171 acres of land, consisting of creek and river bottom with some contiguous rolling and brush covered hills. Of the 1171 acres, 668 acres were reported as being used exclusively for pasture.

In both districts use of pasture crops was an outstanding practice. In the Arcata district pasturing was available for from eight to twelve months out of the year. Much year-round pasturing was practiced but if pasture became short the shortness occurred during the months from November to March inclusive. Pasture grasses were largely clover and rye grass which combined to make a thick sod and to produce much feed. To supplement the pasture, use was made of such soiling crops as green vetch grown either singly or with barley or oats; clover, or clover and rye grass; green corn; green peas and barley; or some similar feed. Feeding of these green crops occurred during the late spring and summer months. When pasturage was either not available or scanty and green crops not to be had, hay of clover, rye grass, or both clover and rye grass, or oats and rye grass, or vetch and oats or barley, or a little alfalfa, was fed during the late fall and winter months. Use was likewise made of turnips and carrots from August on for a few months, and of beets and rutabagas during the late fall and winter months. With only a single exception, concentrates were coconut meal and barley, with some use of mill feeds, alfalfa meal, bran, beet pulp, molasses meal, and mill screenings. Few changes in the character of the concentrates fed were made during the year. Six dairymen used three kinds, and two each used four, one, and two kinds. Two men made use of silage during the winter months.

In the Orick-Requa district reliance was placed upon pasturage supplemented with hay, roots, and green feeds. All dairymen included in the studies conducted in this section possessed pasture, all but three reporting year-round pasturing, with the others having pas-

ture for six months or more, usually available from April to October inclusive. All dairymen supplemented their pasture with hay of which oat hay was more generally used, although some use was made of clover, clover and rye grass, barley, and alfalfa hays. One dairyman fed hay the year round but the majority confined hay feeding to the period from September to April, inclusive. Eight of these twelve dairymen made use during the summer months of such green feeds as green clover, green corn, and green vetch. One dairyman utilized corn as silage during the fall months. Feeding of carrots was generally practiced with some feeding of beets, such feeding being done during the months of August to March inclusive. Ten of these dairymen fed concentrates for periods varying from one to twelve months. Feeding of concentrates apparently followed no general rule, for one dairyman fed for but a single month, three more for two months, one each for three, four, eleven, and twelve months, and two for five months. When fed the usual plan was to utilize concentrates during the months from October to May with greatest feeding taking place during February, March, and April. Of the various concentrates these dairymen favored coconut meal and barley, with some use of beet pulp, mill feeds, alfalfa meal, middlings, and bran. Four dairymen fed but a single kind of concentrates, three fed two kinds, one fed three kinds, and two fed four kinds.

The total number of cows carried throughout the year averaged 493 in the Arcata district and 397 in the Orick-Requa district. The size of herd ran from 10 to 76 cows. In the Arcata district 8 of the 13 herds numbered from 10 to 37 head, 3 dairies from 45 to 55 head, and one each of 75 and 76. In the Orick-Requa section, 9 of the 12 herds averaged during the year from 12 to 34 head, the remaining 3 containing respectively 50, 59, and 62 head. The average of all herds in the Arcata district was 68; in the Orick-Requa district 33.

The Jersey breed predominated in both districts. Of the 13 Arcata herds studied, 4 were composed of Jerseys, 4 of Guernseys, 2 of Jerseys and Guernseys, 1 of Shorthorns and Holsteins and 3 of mixed breeds. In the Orick-Requa district 11 of the 12 herds were reported as being Jerseys and the twelfth as "grade."

Nine of the Arcata dairies and 8 of the Orick-Requa herds were headed by purebred bulls, numbering 19 head of which 16 were registered. Of the total, 13 were reported as Jerseys, 5 as Guernseys, with 1 not stated. Two registered Guernsey cows from the Arcata district and 5 registered Jersey cows from the Orick-Requa district were reported.

In both the Arcata district and the Orick-Requa district the universal plan on the dairies studied was to breed for freshening in January, February, or March.

Milking took place at twelve-hour intervals, all dairymen milking at four, five, or six o'clock. Eight of the Arcata and three of the Orick-Requa dairymen used milking machines, the rest practiced hand milking.

Fig. 3.—Dairying in the redwoods, cleared land. The Orick-Requa dairies were operating under these conditions.

Nationality of milkers included American, Swiss, Portuguese, Indians, Scotch-Irish, and Danes. In the two districts the nationalities of the operators were made up of 13 Americans, 5 Swiss, 3 Portuguese, 3 Danes, and 1 Scotch-Irish.

Of the 13 dairymen in the Arcata district 9 sold whole milk and 4 sold butterfat. Of the 12 dairymen in the Orick-Requa district all sold whole milk. In the Arcata district skimmilk and buttermilk, bought back from the creameries, were utilized in the feeding of calves and hogs. Sales from the Arcata district were made to the California Central Creameries, and to the United Creamery Association. The dairymen at Orick sold their product to the California Central Creameries' cheese factory located at Orick, while the milk from the Requa dairies went to the Requa cheese plant of the Western Meat Company.

Eight of the Arcata and nine of the Orick-Requa dairymen were owners of the farms under their control, the others were tenants.

Summary of Costs.—The kind and amount of the various items entering into the Arcata and the Orick-Requa districts are set forth separately in the two following tables.

TABLE 1

COST OF MILK PRODUCTION SUMMARY—ARCATA DISTRICT, HUMBOLDT COUNTY

Number of dairies	13	
Number of cows	493	
Number of bulls	18	
Costs		
Operating		
Labor		
Man—manual, 79,950 hours	$ 18,295.00	
Man—management	6,540.00	
Horse, 1,968 hours	483.61	
Insurance	70.00	
Total labor cost		$25,388.61
Feed		
Pasture	$9,688.00	
Hay, 807.36 tons	17,483.25	
Concentrates, 269.91 tons	9,772.48	
Roots, 2,374 tons	4,450.30	
Green feed, 1,324 tons	5,660.30	
Silage, 34 tons	204.00	
Alfalfa meal, 7½ tons	243.00	
Total feed costs		47,501.33
Hauling milk		1,948.43
Supplies, cow testing, etc.		1,452.63
Interest on operating capital, $5,100 @ 6%		306.00

Herd charge			
Interest on average investment in cattle, $40,802.56 @ 6%		$2,448.14	
Mortality: 18 cows, $1290		1,290.00	
Taxes		702.92	
Insurance		75.00	
Gross herd charge		$4,516.06	
Appreciation		560.45	
Net herd charge			3,955.61
Building charge			
Interest on average investment of $25,950.50 @ 6%		$1,557.02	
Depreciation		695.00	
Upkeep		165.00	
Taxes		192.28	
Insurance		112.90	
Total buildings charge			2,722.20
Corral charge			
Use of land, including taxes, 17½ acres		$319.50	
Interest on investment in improvements, $2,838.33 @ 6%		170.29	
Depreciation of improvements		327.30	
Upkeep		137.00	
Total corral charge			$954.09
Equipment charge			
Interest on average investment of $4,724.15 @ 6%		$283.41	
Depreciation		796.81	
Upkeep		554.53	
Taxes		15.42	
Total equipment charge			1,650.17
Total Gross Cost			$85,879.07
Credits			
Calves, 168	$677.50		
Hides	26.50		
Manure	1,911.50		
Total credits	$2,615.50		
Net cost of whole milk			$83,263.57
Total production of whole milk			3,048,690 pounds
Cost per hundredweight of whole milk			$2.73
Net cost of butterfat in cream			
Net cost of whole milk			$83,263.57
Credit for skimmilk, 22,207.24 hundredweight @ 11.7 cents per 100 pounds			2,597.82
Net cost of butterfat in cream			$80,665.75
Total production of butterfat in cream			131,842.08 pounds
Cost per pound of butterfat in cream			61.2 cents
Average annual production per cow			6184 pounds of whole milk 267.4 pounds of butterfat

TABLE 2

COST OF MILK PRODUCTION SUMMARY—ORICK-REQUA DISTRICTS, HUMBOLDT AND DEL NORTE COUNTIES

Number of dairies		12
Number of cows		397
Number of bulls		13
Costs		
Operating		
Labor		
Man—manual, 48,479 hours	$12,925.20	
Man—management	4,080.00	
Horse, 5,242 hours	978.98	
Truck and automobile, 9,945 miles	898.50	
Total labor cost		$18,882.68
Feed		
Pasture	$8,864.00	
Hay, 505.5 tons	13,491.00	
Concentrates, 67.62 tons	3,256.14	
Roots, 1170 tons	2,500.80	
Green feed, 426 tons	1,500.80	
Silage, 29 tons	174.00	
Alfalfa meal, 2½ tons	156.50	
Insurance	87.00	
Total feed costs		30,030.24
Hauling milk		817.12
Supplies, cow testing, etc		1,200.92
Interest on operating capital, $3,350.00 @ 6%		201.00
Herd charge		
Interest on average investment in cattle, $45,247.99 @ 6%	$2,714.87	
Mortality: 3 cows, $475; 1 bull, $200	675.00	
Taxes	358.80	
Gross herd charge	$3,748.67	
Appreciation	1,864.10	
Net herd charge		1,884.57
Buildings charge		
Interest on average investment of $11,594.50 @ 6%	$695.67	
Depreciation	464.75	
Upkeep	160.20	
Taxes	77.38	
Insurance	117.66	
Total buildings charge		1,515.66

Corral charge		
Use of land, including taxes	$222.50	
Interest on investment in improvements, $875.23 @ 6%	52.51	
Depreciation of improvements	125.00	
Upkeep	2.00	
Total corral charge		402.01
Equipment charge		
Interest on average investment of $2,554.21 @ 6%	$153.24	
Depreciation	585.75	
Upkeep	399.18	
Taxes	10.32	
Total equipment charge		1,148.49
Total gross cost		$56,082.69
Credits		
Calves, 165	$839.00	
Hides	168.80	
Manure	1,199.00	
Total credits	$2,206.80	
Net cost of whole milk		$53,875.8
Total production of whole milk		2,230,182 pounds
Cost per hundredweight of whole milk		$2.41
Total production of butterfat in whole milk		98,746.4 pounds
Cost per pound of butterfat in whole milk		54.5 cents
Average annual production per cow		5618 pounds of whole milk. 248.7 pounds of butterfat.

Comments on Cost Findings

The thirteen herds under observation in the Arcata district were assessed for taxes at $17,270. Buildings utilized by the dairy were assessed at $4527, and dairy equipment at $375. The tax rate varied from $3.40 to $4.50 per $100 of assessed values. In the Orick-Requa district the dairy cows on the twelve dairies where studies were conducted were assessed at $13,195, buildings at $2905, and dairy fixtures at $400. The tax rate varied from $2.55 to $2.99.

Insurance on buildings was rather generally carried, eleven of the Arcata and six of the Orick-Requa dairymen reporting sums so spent. One dairyman of the Arcata district carried livestock and employer's liability insurance. Two dairymen in the Orick-Requa district carried feed insurance.

The average cost of manual labor used on these dairies, based on the totals as shown in the tables, amounted to 22.9 cents per hour in the Arcata district and 26.6 cents in the Orick-Requa district. All the dairymen placed a figure representing their idea of a proper management charge. These figures are shown in the summary tables and amounted to 36 per cent of the manual labor expenditures in the Arcata district, and 31 per cent in the Orick-Requa district.

Horses were used in connection with the dairy on but five of the Arcata and four of the Orick-Requa districts. The cost on these nine dairies varied from 10.6 cents to 40.7 cents per hour of use. The average cost amounted to 24.6 cents in the Arcata and 18.7 cents in the Orick-Requa districts.

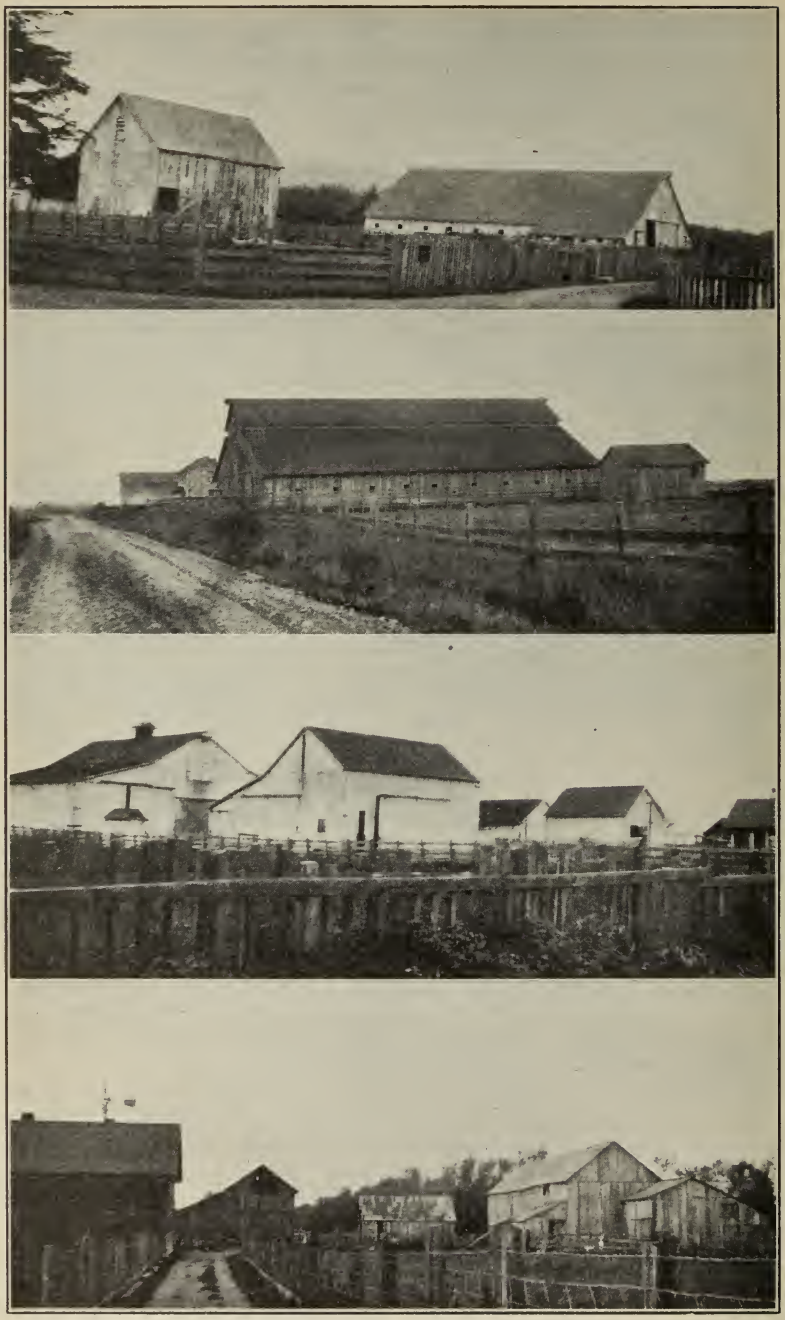

Fig. 4.—Typical farmstead layouts of the Arcata dairying district.

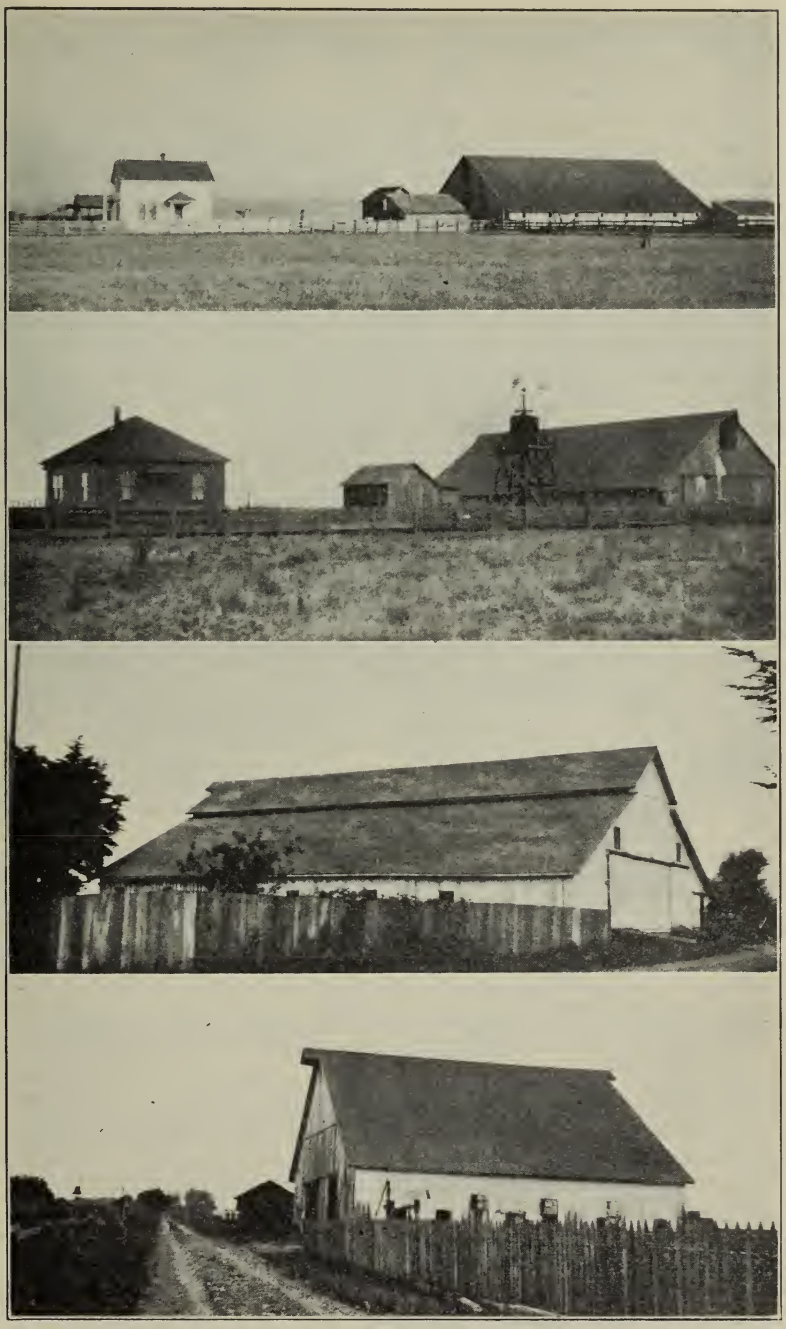

Fig. 4.—(*Continued.*)

Trucks and automobiles did not figure in the Arcata dairying activities under study, but in the Orick-Requa district 6 of the dairies utilized 4 trucks and 2 automobiles. Costs per mile varied from 7.2 cents to 10.2 cents per mile of use, averaging 9 cents per mile.

The methods of feeding followed by the two sections during the year that these dairies were under observation have already been covered above. During the year from March 1, 1922, the cost for feeds consumed by the total number of cows and bulls comprising the milking herds amounted to: Pasture $20.84 per cow per year; hay $23.59 per ton; roots $1.96 per ton; green feed $4.09; silage $6.00; concentrates $38.09.

All the Arcata dairymen paid for contract hauling of their dairy products and in addition each spent from $11.93 to $278.70 for supplies, cow-testing and similar items. Four of the Orick-Requa dairymen paid for contract hauling, the balance doing this work themselves, but the cost is fully covered in the figures for horse labor and use of trucks and automobiles. Estimates of necessary operating capital totaled $5100 for the Arcata district and $3350 for the Orick-Requa district.

Investment in the Arcata herds under observation amounted to $40,802.56, of which $37,632.74 was invested in cows, or slightly less than 93 per cent. The investment in the Orick-Requa herds totaled $45,247.99, of which $42,869.25 was made up of cow values, or close to 95 per cent. In the two districts cow values per head ranged from $42.50 to $200, but averaged close to $76 in the Arcata and $108 in the Orick-Requa districts. Bull values ranged from $15 to $612.50, but averaged about $179.

Based on sales, deaths, purchases, and heifers brought into the milking strings, the thirteen Arcata dairies enjoyed appreciation, that is an increase in value, of its dairy cows amounting to $763.45, while bulls depreciated $203, thus leaving a net appreciation for the total animals in the milking herds of $560.45. In the Orick-Requa district appreciation of cows amounted to $1674.10, and bulls gained in value to the extent of $190, so that total herd appreciation in this section totaled $1864.10.

During the year covered by the record taking, the Arcata dairies lost 18 cows valued at $1290, and no bulls. The Orick-Requa district lost 3 cows valued at $475 and 1 bull valued at $200. Total mortality therefore amounted to $1965. The average value of all cows dying amounted close to $84 as against a general average for both districts of $90.55. Death losses, in percentages, amounted to 3.7 per cent of the cows and 0 per cent of the bulls in the Arcata district, and to 0.8 of 1 per cent of the cows and 8 per cent of the bulls in the Orick-Requa district.

Buildings utilized in connection with the dairies varied in extent, construction, and investment. The 25 dairies in the 2 districts possessed 26 milking barns (one dairy having 2), 10 milk houses, 2 shelter barns, 1 hay barn, 1 bull shed, 2 silos and an engine house. The investment per dairy farm averaged $1501.80, but ranged from $93.50 to $3889.50. Of the 25 dairies 10 had less than $1000 invested in buildings, 5 between $1000 and $2000, 8 between $2000 and $3000, and 2 in excess of $3000. The average investment in the Arcata district was close to $2000, while in the Orick-Requa district the figure amounted to about $1000 per dairy. Eleven of the 25 made expenditures for building upkeep, ranging from $6 to $97, totaling $325 for both districts, or 0.9 of 1 per cent of the investment. Depreciation of dairy buildings amounted in money to $1136, or practically 3 per cent of the investment.

The 25 dairies in these 2 districts utilized 33¾ acres of land in corrals and dairy building sites, averaging about 1⅓ acres, but ranging from ¼ to 4 acres. This land was given a rental value of $2.50 to $75 per acre, averaging $16.06 per acre per year. Investment in improvements such as water facilities, corral fences, shelters, and so on, totaled $2838.33 for the Arcata dairies and $875.23 for the Orick-Requa dairies. The average investment to the dairy in such items was therefore close to $218 in the Arcata and to $73 in the Orick-Requa districts. The range in investment varied from $13.75 to $367.12. Eleven of the 25 dairies possessed an investment of less than $100 in corral improvements, 6 had from $100 to $200 invested, 3 from $200 to $300, and 5 (all in the Arcata district) over $300. Seven of these dairymen made expenditures for corral upkeep, ranging from $2 to $75, and totaling $139, or approximately ½ of 1 per cent of the investment. Depreciation amounted to $452.30, or 16 per cent of the amount invested.

Dairying equipment listed from the 25 dairies in these 2 districts consisted of 11 milking machines, 8 of which were on the Arcata dairies, 302 milk cans, 82 milk pails, 1 motor, 4 milk tanks, 8 separators, 11 feed troughs, 1 milk trough, and a supply of forks, brooms, shovels, brushes, and similar miscellaneous items. The investment on the 25 dairies amounted to $7278.36, amounting on an average to $271.13, and ranging from $26.85 to $892.37. The average for the Arcata district amounted to $363.39, and for the Orick-Requa district to $212.83. Of the total 25 dairies, 6 possessed dairy equipment amounting to less than $100 each, 9 had an investment of from $100 to $300, 8 of from $300 to $600, and 2 of more than $600. All dairymen expended sums of money on upkeep, varying from 90 cents to $127.75, and totaling $953.71 or 13 per cent of the investment. Depreciation amounted during the year to $1382.56, or 19 per cent of the value of the investment.

Miscellaneous returns to the dairies, other than sales of milk and cream, or credits for calves, manure, and skimmilk, consisted of empty feed sacks and hides. Sales of feed bags totalled $104 and of hides $26.50. These credits were carried directly to the department involved and the proper allowance there made.

Dropped calves kept for raising or for vealing were variously valued at from 75 cents to $50. In the Arcata district 168 calves were valued at $667.50, most of these being rated as worth $5 each. In the Orick-Requa district 165 calves were deemed worth saving and were given a total value of $839, with most of them priced at $5 per head.

Dairymen figured the value of the manure from the dairies on the basis of its value to them since no sales were made. Totals of the various estimates are given in the respective summary tables. All the dairymen placed some value on the manure product.

Of the total production from the 13 dairies in the Arcata district consisting of 3,048,690 pounds of whole milk, 3.5 per cent was used on the dairy, 27.5 per cent sold as butterfat in cream, and 69 per cent sold as whole milk. Testing from 3.68 to 4.76 per cent butterfat in the whole milk, this was equivalent to a butter fat production of 131,842.08 pounds. The average test therefore amounted to 4.32 per cent butterfat. Credit for skimmilk in this district amounted to 22,207.24 hundredweight at an average valuation of 11.7 cents per hundred. In the Orick-Requa district total production amounted to 2,230,182 pounds of whole milk, testing from 4.12 to 4.74 per cent butterfat, or an average of 4.43 per cent. The production in terms of butterfat amounted to 98,746.4 pounds. Of the total pro-

duction 8.9 per cent was used on the dairies, while 91.1 per cent was sold. Of the total sales, 6 dairies sold butterfat as cream, while the remaining 6 sold whole milk receiving a small credit for the skimmilk contained therein. Close to 36.4 per cent of the total sales were made as cream, with 54.7 per cent sold as whole milk.

The average annual production per cow, figured upon the number maintained in the milking herd throughout the year amounted in the Arcata district to 6184 pounds of whole milk or 267.4 pounds of butterfat. In the Orick-Requa district the figures came to 5618 pounds of whole milk per cow or 248.7 pounds of butterfat. The lowest average herd yield in the Arcata district amounted to 3979 pounds of whole milk per cow per year, while the lowest butterfat yield was 159.1 pounds. The highest average herd production in this same district ran to 7938 pounds of whole milk per cow per year, and 347.3 pounds of butterfat. In the Orick-Requa district the lowest yield for any herd stood at 4009 pounds of whole milk or 177.9 pounds of butterfat per cow per year. The highest herd average in the Orick-Requa district was 7816 pounds of whole milk per cow containing an average of 360.7 pounds of butterfat. In the Arcata district the average herd production fell below 6000 pounds per cow on 8 dairies, 1 of these being below 5000 pounds. In the Orick-Requa district 7 herds averaged below 6000-pound production, 4 of these 7 being under 5000 pounds. Figured on butterfat production, 7 of the 13 dairies studied in the Arcata district had an average butterfat per cow production of less than 250 pounds for the year, while 4 had a production in excess of 300 pounds. In the Orick-Requa district 5 of the 12 dairies where record taking was conducted fell below a 250-pound average, with two topping the 300-pound figure.

Based on receipts obtained by the dairymen coöperating in the collection of these costs data, the average weighed net price received from whole milk deliveries in the Arcata district was $1.97 per hundredweight, while the average price obtained for butterfat was 44.7 cents per pound. In the Orick-Requa district the selling price of whole milk amounted to $2.12 per hundredweight, and 47 cents per pound for butterfat contained therein.

Costs of Production by Individual Dairies

In tables 3 and 4 are set forth the average costs for the twenty-five dairies under observation for an entire year in the Arcata and Orick-Requa districts. These columns set forth, one for each dairy, the various items entering into the cost of producing milk, and serve to indicate the wide spread in costs between different dairies operating in the same section. The items are given in terms of cost per cow rather than as totals for the dairy. The latter can be determined by multiplying the amount shown in the table by the number of cows as set forth in the second horizontal column.

Dairies numbered 318 to 331 inclusive are in the Orick-Requa district: Those numbered 380 to 392 inclusive are in the Arcata district.

From the data here assembled, the cost of production for the different herds in the Arcata district mounted from $2.22 to $5.77 per 100 pounds of whole milk. Butterfat production varied from 46.1 cents to almost $1.42 per pound. In the Orick-Requa district the cost

TABLE 3

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE ARCATA DISTRICT

Dairy No.	Average of District	380	381	382	383	384	385	386	387	388	389	390	391	392
No. of cows	493	23	37	12	76	32	75	21	45	55	49	29	10	29
Cost Items:														
Labor	$51.50	$56.39	$45.01	$97.92	$61.05	$45.06	$45.80	$55.95	$47.19	$43.30	$53.06	$42.22	$89.00	$46.21
Feed	96.35	147.31	110.12	161.92	95.42	105.79	94.57	89.84	120.88	70.84	75.23	73.58	100.85	79.85
Minor items	7.52	11.42	2.99	5.44	7.43	8.63	11.39	8.10	4.17	4.42	9.18	8.53	9.20	6.33
Herd charge	8.02	7.50	4.36	*23.93	10.31	13.53	8.85	16.12	9.48	4.26	8.48	18.61	16.64	*3.18
Building charge	5.52	8.40	6.57	15.42	4.73	7.05	4.25	5.00	3.78	4.34	4.99	10.09	10.08	1.52
Corral charge	1.94	6.41	2.36	2.55	.88	3.20	1.44	3.26	1.96	1.92	1.03	1.58	3.11	.75
Equipment charge	3.35	4.56	3.32	7.72	1.63	3.29	2.48	6.51	1.33	3.62	5.26	3.85	12.37	.86
Total gross cost	$174.20	$241.99	$174.73	$290.97	$181.45	$186.55	$168.78	$184.78	$188.79	$132.70	$157.23	$158.46	$241.25	$135.52
Credits—calf, hide, manure and herd	5.31	12.17	4.02	38.10	2.63	4.53	7.39	3.19	6.18	4.08	5.75	2.97	11.60	5.40
Net cost of whole milk	$168.89	$229.82	$170.71	$252.87	$178.82	$182.02	$161.39	$181.59	$182.61	$128.62	$151.48	$155.49	$229.65	$130.12
Production of whole milk, pounds	6184	7345	5960	7938	5238	5519	7123	6877	7420	5805	5858	5824	3979	5574
Cost per hundredweight of whole milk	$2.73	$3.13	$2.86	$3.18	$3.41	$3.30	$2.27	$2.64	$2.46	$2.22	$2.58	$2.67	$5.77	$2.33
Net cost of whole milk	$168.89	$229.82	$170.71	$252.87	$178.82	$182.02	$161.39	$181.59	$182.61	$128.62	$151.48	$155.49	$229.65	$130.12
Credit for available skimmilk	5.27	5.54	5.58	7.72	5.29	4.93	5.13	6.82	7.57	4.25	4.17	4.28	3.82	4.92
Net cost of butterfat	$163.62	$224.28	$165.13	$245.15	$173.53	$177.09	$156.26	$174.77	$175.04	$124.37	$147.31	$151.21	$225.83	$125.20
Production of butterfat, pounds	267.4	347.3	226.6	333.4	235.7	261.9	339.4	280.9	311.6	243.0	240.7	214.7	159.1	235.0
Cost per pound of butterfat, cents	61.2	64.6	72.9	73.5	73.5	67.6	46.1	62.2	56.1	51.1	61.2	70.4	141.8	53.3

* Credit.

TABLE 4

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE ORICK-REQUA DISTRICT

Dairy No.	Aver. of District	318	319	322	323	324	325	326	327	328	329	330	331
No. of cows	397	62	59	33	33	50	12	25	12	34	26	23	28
Cost items:													
Labor	$47.56	$44.82	$37.62	$47.25	$39.06	$44.85	$41.25	$65.88	$71.63	$53.88	$49.62	$45.06	$58.36
Feed	75.64	65.98	75.13	55.97	55.00	79.68	131.83	83.16	92.05	72.49	102.94	57.81	93.71
Minor items	5.59	3.57	10.35	5.42	2.46	6.70	7.94	2.86	3.00	6.35	8.81	2.34	3.25
Herd charge	4.75	1.29	17.99	20.99	9.29	7.12	*5.61	7.78	.04	*44.04	*32.28	.20	56.87
Building charge	3.82	2.78	4.32	2.96	2.62	4.39	6.49	3.71	6.37	3.75	5.44	6.27	.86
Corral charge	1.02	1.11	.99	1.07	.76	1.10	1.48	1.34	.55	.26	1.86	.70	1.01
Equipment charge	2.89	1.59	2.14	2.22	1.81	4.39	2.61	1.82	1.38	5.90	5.09	3.68	2.14
Total gross cost	$141.27	$121.14	$148.54	$135.88	$111.00	$148.23	$191.60	$166.55	$175.02	$142.63	$173.76	$116.06	$216.20
Credits—Calf, hide, manure, and herd	5.56	4.56	6.31	4.09	9.67	8.10	7.90	4.80	5.25	48.60	36.97	2.83	5.00
Net cost of whole milk	$135.71	$116.58	$142.23	$131.79	$101.33	$140.13	$183.70	$161.75	$169.77	$ 94.03	$136.79	$113.23	$211.20
Production of whole milk, pounds	5618	4876	6156	4509	4009	5145	6759	6656	4498	6276	6361	5536	7816
Cost per hundredweight of whole milk	$2.41	$2.39	$2.31	$2.92	$2.53	$2.72	$2.72	$2.43	$3.77	$1.50	$2.15	$2.04	$2.70
Production of butterfat, pounds	248.7	207.2	262.9	185.7	177.9	233.5	291.4	283.3	211.3	301.2	280.9	259.0	360.7
Cost per pound of butterfat in whole milk, cents	54.5	56.2	54.0	70.8	56.9	60.0	63.0	57.0	80.3	31.2	48.7	43.7	58.5

* Credit.

of producing whole milk ranged in the different herds from $1.50 to $3.77 per 100 pounds, and from 31.2 cents to 80.3 cents per pound of butterfat.

In the Arcata district costs of producing whole milk were below the average of the district on 7 dairies of the 13, while the cost of producing butterfat was at or below the average of the district on 5 dairies. In the Orick-Requa district 5 dairies produced whole milk at a cost below the district average, while 4 dairies produced butterfat at less than the district average cost.

2. MARIN–SONOMA DISTRICT

Brief Description of Area

Nineteen dairies in the western parts of Marin and Sonoma counties consistently furnished data for an entire year, seven of these reports covering the period from November 1, 1921, to October 31, 1922, the balance from January 1 to December 31, 1922. These 19 were located as follows: 2 at Fallon, 2 at Tomales, 1 at Valley Ford, 2 at Bloomfield, 6 at Bodega, 1 at Freestone, 2 at Two Rock, and 3 at Petaluma. The size of the ranches utilized primarily for dairying ranged from 100 to 1700 acres, with 12 of the 19 ranging from 210 to 599 acres. Two ranches were under 200 acres in size, and 4 over 600 acres. The holdings consisted of open rolling hills, utilized as natural grass pasture during the times of the year when the rains provided a satisfactory growth, with some areas plowed and seeded to grain for hay. Oats largely predominated in the seeding, although some barley, and some vetch mixed with oats were utilized. The amount of land used for farmed crops varied with the different ranches, but for the total number amounted to close to 25 per cent. In feeding the milking herd, sole use of pasture was the rule whenever good pasture was available. Pasture was commonly utilized during the months of April, May, June, and July. One ranch reported use of pasture in March, and seven secured pasturage in August and September. When on full pasture cows received no other feed. During the remainder of the year they were fed hay and concentrates with some silage, carrots, potatoes and pumpkins. Oat hay comprised the major portion but there was also some use of alfalfa, imported from other sections, barley hay, and a small amount of volunteer and of oats and vetch hays. Concentrates consisted of cottonseed meal, cocoanut meal, linseed meal, barley, molasses, wheat, oil cake, dried beet pulp, middlings, bran, alfalfa meal, and screenings. The common

practice eliminated the concentrates and hay when pasturage is available, only one dairy reporting the supplementing of the pasture at all times with some additional feed. A total of 5436 acres was utilized as pasture by these nineteen dairies, or 76 per cent of the gross available acreage, the balance being retained for growing young stock and for horses. The average feed value amounted to $2.68 per acre per year.

The size of herds in these 19 dairies ranged from an average for the year of 22 cows and 1 bull to 128 cows and 2 bulls for the year with a third bull for six months. Three dairies had 30 cows or less, 5 from 31 to 40, 4 from 41 to 50, 1 from 51 to 60, 4 from 61 to 70, 1 from 81 to 90, and 1 had 128. The average for all the dairies was 52 cows and 1½ bulls. The total number of cows in the district included in this survey was 996 and the bulls numbered 27.

Of breeds, 6 dairies were running Jerseys; 3 Durham; 2 each Holstein, mixed Durham and Holstein, and scrubs; 1 each Jersey, Durham, and Holstein, Jersey and Durham, and Jersey and Guernsey. There were 3 purebred registered Jersey cows reported, and 14 dairies using purebred bulls, several of them registered, so that of the 27 bulls in use on all dairies 18 were considered to be of good breeding. These 18 bulls were made up of 11 Jerseys, 6 Guernseys, and but a single Holstein.

The cows were uniformly bred to calf from October to early spring. The bulk of the calves were born during October, November, and December. Some calving continued at intervals until as late as May, although the number born in February or later was small.

Milking was done at 12-hour intervals, usually at 5 A.M. and 5 P.M., although some schedule their milking for either 4 or 4:30. Nine of the dairies were using milking machines, the remainder relied on hand milking.

Seventeen of the nineteen dairymen gave their nationality as Americans, although in some cases obviously of foreign parentage or naturalized. One was Swiss and the other Italian. The milkers were reported as being mainly Americans, with a sprinkling of Swiss, Italian, and Spanish.

Dairymen in this section were primarily interested in the production of butterfat, sales of whole milk being negligible and then principally for cheese-making purposes. The milk was separated at the ranch and then sent to the creamery either under contract hauling or by ranch conveyance. During the year under observation sales were made by these dairymen to the Petaluma Coöperative Creamery, the

Fig. 5.—Typical grass pastures—bur clover, wild oats, alfilaria and rye grass—Marin and Sonoma counties. Principal dairy feed during April to July inclusive. 1. Near Two Rocks. 2. Near Bodega. 3 and 4. Near Valley Ford.

Bodega Coöperative Creamery, the Cremo Milk Company, and to the Western Refrigerating Company. Resulting skimmilk was used for calf, chicken, and hog feeding. Of the nineteen operators seven were tenants and twelve were owners of the dairies that they were handling.

Summary of Costs

In the table immediately following are set forth the findings resulting from the assembling of the various data worked out in detail for each of the nineteen dairies covered in this district.

TABLE 5

COST OF MILK PRODUCTION SUMMARY—MARIN AND SONOMA COUNTIES

Number of dairies	19	
Number of cows	996	
Number of bulls	27	
Costs		
Operating		
Labor		
Man—manual, 102,849 hours	$24,786.61	
Man—management	2,086.03	
Horse, 7,500 hours	1,187.54	
Truck and automobile, 16,104 miles	2,007.80	
Liability insurance of workmen	25.00	
Total labor cost		$30,092.98
Feed		
Pasture, 5436 acres	$14,602.17	
Hay, 1,447.35 tons	22,968.43	
Concentrates, 756.23 tons	24,820.69	
Silage, 245.25 tons	1,643.50	
Roots and tubers, 79 tons	603.00	
Total feed cost		64,637.79
Hauling milk and cream		827.56
Supplies, cow testing, etc.		3,531.72
Interest on operating capital, $6,375 @ 6%		382.50
Herd charge		
Interest on average investment in cattle, $71,148.41 @ 6%	$4,268.90	
Mortality: 30 cows, $1,735; 1 bull, $500	2,235.00	
Depreciation	2,762.50	
Taxes	869.15	
Insurance	12.50	
Total herd charge		10,148.05

Buildings charge		
Interest on average investment of $51,443.50 @ 6%	3,086.61	
Depreciation	2,072.00	
Upkeep	986.68	
Taxes	438.14	
Insurance	166.08	
Total buildings charge		6,749.51
Corral charge		
Use of land, including taxes	171.75	
Interest on investment in improvements, $3,570 @ 6%	214.20	
Depreciation of improvements	348.50	
Upkeep	83.71	
Total corral charge		818.16
Equipment charge		
Interest on average investment of $12,881.46 @ 6%	$772.88	
Depreciation	2,648.67	
Upkeep	468.70	
Taxes	67.40	
Insurance	7.50	
Total equipment charge		$3,965.15
Total gross cost		$121,153.42
Credits		
Manure	$1,660.00	
Calves, 771	2,772.00	
Skimmilk, 42,891 hundredweight @ 25c	10,722.93	
Total credits	$15,154.93	
Net cost of butterfat		$105,998.49
Total production of butterfat		215,260.2 pounds
Average cost per pound of butterfat		49.2 cents
Average annual production per cow		216.1 pounds of butterfat

Comments on Cost Findings

The value of the cows and bulls, according to the assessment figures, amounted to $22,380, and the dairy fixtures to $1860. Based on an arbitrary pro-rating of the building assessment, varying from 15 to 70 per cent of the total building assessment, the dairy buildings assessment amounted to $11,357. The tax rate varied with the locality from $3.11 to $5.44 per $100 of assessed values. The average tax rate for the district was $3.84.

Of the 19 dairymen, 11 carried building insurance, 2 insurance of bulls, and 1 each insurance of dairy equipment and employer's liability insurance.

A total of 102,849 hours of manual labor, costing $24,786.61, was expended during the year in the conducting of these nineteen dairies. This amounted to an average of 24.1 cents per hour. Management was determined by finding the difference between the operators' estimates of their own time and the rate charged for manual labor, making due allowance for manual work contributed by them. Management thus amounted to $2,086.03, or 8.4 per cent of the manual labor charge.

Twelve of the nineteen dairies used horses in carrying on the work, the remaining number not deeming enough horse labor used to warrant its inclusion. The cost per hour for horse labor ranged from 8.4 to 40.7 cents per hour, with an average per hour horse cost of 15.8 cents. Seven thousand five hundred hours of horse labor comprised the total use on the dozen dairies utilizing horse power.

Likewise 12 of the nineteen dairies used either trucks or automobiles in connection with the operation of the dairies. The mileage cost varied from 7.1 to 47.2 cents, with an average of 12.5 cents. These automobiles and trucks traveled a total of 16,104 miles for the dairies.

The pasturage cost averaged $768.53 per dairy, or amounted to $2.62 an acre a year or $14.66 per cow per year. The average costs per ton for other feeds amounted to: Hay $15.89; concentrates $32.94; roots and tubers $7.63; silage $6.70.

Fig. 6.—Typical dairy building equipment of the western Marin-Sonoma section.

Eleven of the nineteen dairies paid for contract hauling of dairy products, the other eight did all the work themselves.

Operating capital amounted to $6375 or an average per dairy of $335.

Considerable range was found to occur in the average head values of cows and bulls in getting at the amount of investment and of depreciation. For the nineteen dairies the range in cow values based on the averages of the first and second inventories was found to be from $47.50 to $100 per head, as compared with a general average of $66.09. Bull values ranged from a low value of $30 for one bull to a high value of $500 for another individual. The average for all bulls was $164.12. Of the total investment in cows and bulls the cow values made up 84 per cent, the bulls the remaining 16 per cent.

Of the 19 dairies, 8 reported cow appreciation and 11 depreciation; 3 reported bull appreciation. Net depreciation for the district totaled $2762.50.

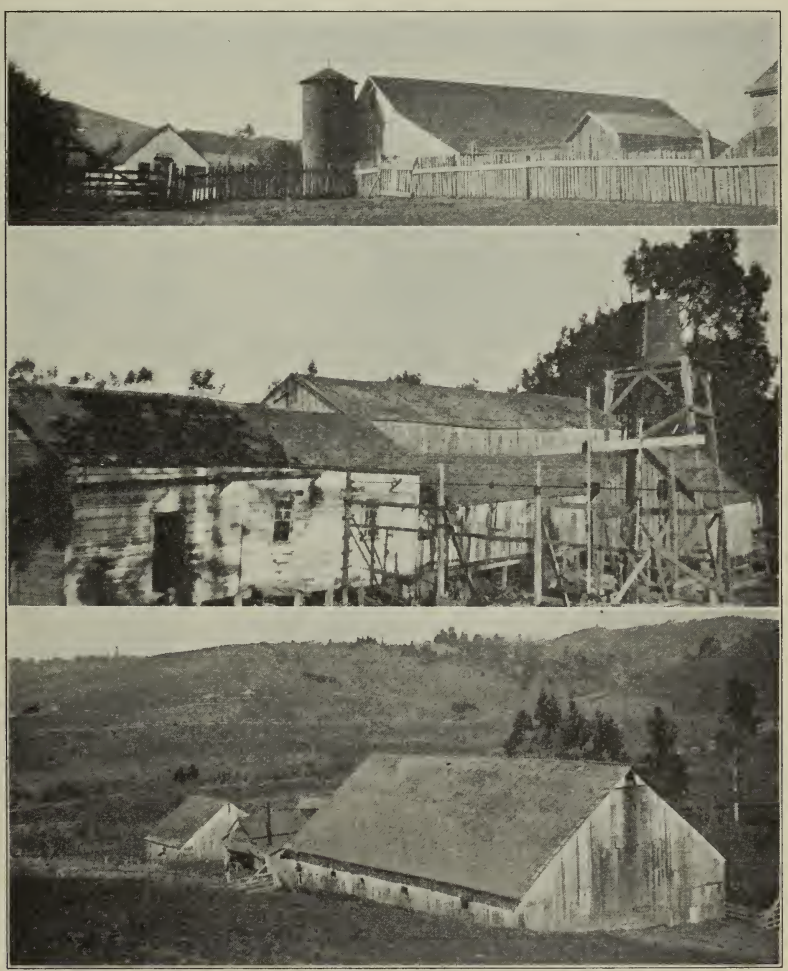

Fig. 6.—(*Continued.*)

Herd mortality consisted of 30 head of cows valued at $1735, or $57.85 per head. These cows, compared with the average value of the total number, were therefore valued at 87 per cent of the herd average. Only one bull died, and his value was placed at $500. This was the highest valued bull of the twenty-seven reported for this district.

The investment in dairy buildings ranged from $1267.50 to $9965. The majority of the dairies, however, including all but five, had an investment of less than $3000 each. Of the five excepted only a single dairy had more than $5000 invested, this being the dairy already indicated as highest in dairy building equipment, viz., $9965. The average for the dairies studied was $2708.

Being an old dairy section many of the buildings are of long standing, and were constructed during times of lumber and labor costs below those of present times. In numbers of structures the 19 dairies covered by this study possessed 19 cowbarns, 19 milk houses, or 1 cowbarn and 1 milk house for each dairy, 3 bull barns, 10 silos on 6 ranches (4 having 2 silos each), and 3 granaries. A dwelling used partly for dairy workers and a bunkhouse were also found, their use, however, being charged for determining the rate for man labor.

Fourteen dairies encountered building upkeep expense during the year, ranging from $12 to $145.25, the total for all being as set forth in table 5. Upkeep amounted to slightly less than 2 per cent of the investment.

Land used for corrals and building sites, in connection with the dairies amounted to 52¾ acres, with a range of from one-fourth to seven acres, having an average rental value of $3.25 per acre per year, and totalling $171.75 for the nineteen dairies. Investment in improvements such as corral fences, water troughs, and shelter, totalled $3569.65, ranging from $31.75 for one dairy to $366.50 for another. The average investment in these improvements amounted to $198.40. The depreciation of these improvements figured from $3.50 for one dairy to $45.50 for a second, with an average figure of $18.34. Five dairymen spent money on corral upkeep, ranging from $4.00 to $28.00. Corral upkeep amounted to slightly less than 2½ per cent of the investment in corrals.

The dairy equipment investments on the individual dairies varied from a low of $157.40 to a high of $2092, with a general average of $677.97. Seven dairies had an investment of less than $500, 9 of from $500 to $1000, and 2 of more than $1000.

Dairying equipment used by these 19 dairies involved 10 milking machines, 23 separators, 73 buckets, 17 gasoline engines, 205 milk cans, 11 milk vats, 19 milk strainers, 31 lanterns, 5 feed cutters, 42 shovels, 38 brooms, 13 wheelbarrows, 7 boilers, 53 forks, 1 feed mixer, 1 scales, 1 manure carrier, 2 testing outfits, 12 cowbells, 1 sterilizer, and miscellaneous rope, shafting, pulleys, belts, hose, milk stools, and brushes. The total investment in dairying equipment amounted to $12,881.46, which at 6 per cent, gave an interest charge of $772.88. Total depreciation of dairying equipment amounted to $2648.67, equivalent to about 20 per cent of the investment.

Seventeen dairies found it necessary to renew, repair, or otherwise keep up their dairying equipment. Sums spent ranged from a low of $4.50 to a high of $122.55, the total spent being $468.70. Upkeep amounted to 3.6 per cent of the total investment in dairy equipment.

Miscellaneous returns to the dairies, other than sales of milk, butterfat, or credits for calves, manure and skimmilk, consisted of empty sacks and calf hides.

Only eight dairies reported such items and the total return was small, being but $95.95 for all dairies.

Credit for calves dropped ranged from $1 to $12.50 per head of all calves passing the colostrum period. Calves saved for raising were priced relatively high, calves to be vealed were not valued very high. The breed of the cows made some difference, a smaller value attaching to calves from Jerseys and Guernseys than to those of Holstein and Durham, when vealing was to be the fate of the calves. The average value of the calves amounted to $3.71.

Credit for manure amounted to a total of $1660 for the district. Seventeen dairymen deemed the manure of value to them, two considered it an expense. Tenants placed a lower rate than did owners. As practically no sales of manure were made the figures given reflect the dairymen's estimate of the product solely for use upon their own holdings. Most dairymen could not place a value figure for droppings occurring upon fields, their estimates being confined to a consideration of corral scrappings only.

In the summary table, total production of butterfat is reported. Of the total production—215,260.2 pounds—199,157 pounds were sold, the balance being used on the dairy. Hence 93 per cent of the total production went as sales, while the remaining 7 per cent was consumed at the dairy. In terms of whole milk this amounted to a total production of 567,786 gallons, testing from 3.6 to 5.5 per cent butterfat, or an average of 4.4 per cent.

The total production of whole milk and cream resulted in 42,891 hundredweight of skimmilk available for ranch and home use. This was valued at an average of 25 cents per hundred by the dairymen, and amounted to $10,722.93. The range in values was from 15 to 35 cents a hundred, the value depending upon the use made of it. For feeding chickens the value was stated to be greater than if utilized for the feeding of calves or hogs.

The average production per cow, for the 996 involved in the study, amounted to 216.1 pounds of butterfat. The lowest average for a single dairy was 115.3 pounds, the highest 367.8 pounds per cow per year. Eleven dairies of the 19 were above the average, 8 below. For the 7 large dairies, that is dairies having 59 cows or more, the average production was 203.2 pounds of butterfat to the cow a year: for the 12 smaller dairies with 50 cows or less, the average was 232 pounds of butterfat.

According to receipts obtained by the dairymen who sold butterfat in cream, the average net price received during the year from actual sales was 43.8 cents per pound. Whole milk was not sold in sufficient quantities to permit the drawing of satisfactory deductions concerning prices paid.

Costs of Production by Individual Dairies

The summary table of the district presents the average cost for the nineteen dairies covered by the study. Much variation, however, exists from this normal, there being a goodly sprinkling of dairies which are either above or below the average. This is shown in table 6 which sets forth the individual findings for each of the dairies studied in this district. There can be seen the variations both in cost per pound for all butterfat produced by each dairy and as well the vari-

TABLE 6

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE MARIN–SONOMA DISTRICT

Dairy No.	Aver. of Dist.	95	98a	102	103	104	257	258	259	260	261	262	263	264	265	268	274	275	278	281
No. of cows	996	30	59	43	88	40	68	39	70	44	38	28	50	70	22	46	31	128	35	67
Cost items:																				
Labor	$30.21	$48.29	$24.19	$27.66	$22.49	$23.19	$26.47	$20.66	$28.73	$30.93	$36.50	$37.81	$27.50	$35.94	$52.07	$29.77	$31.15	$28.08	$54.82	$27.05
Feed	64.90	69.36	50.06	47.81	43.13	93.44	57.67	56.45	87.91	63.49	68.54	64.06	77.24	61.98	126.17	68.35	56.94	65.48	78.40	52.74
Minor items	4.76	3.55	5.51	3.12	4.08	9.27	4.16	4.81	3.33	4.36	5.17	9.88	6.88	2.29	8.16	6.53	7.68	3.12	3.19	5.15
Herd charge	10.19	29.99	26.86	16.11	5.24	15.93	3.52	1.77	5.86	4.52	3.43	23.79	* .90	15.93	21.11	*8.05	12.25	7.21	13.83	18.00
Building charge	6.78	8.12	4.22	6.42	6.43	8.33	10.91	9.94	4.52	4.17	6.71	6.32	8.70	3.50	11.51	7.94	5.35	7.79	7.79	4.30
Corral charge	.82	2.85	.75	.44	.52	.67	.40	.74	.62	.32	2.04	.62	.75	.57	2.62	.86	1.66	.56	1.27	.70
Equipment charge	3.98	6.23	3.94	5.96	4.91	1.77	3.90	4.09	2.11	4.74	2.66	5.63	2.82	2.67	1.82	6.56	2.19	4.75	5.55	3.06
Total gross cost	$ 121.64	$ 168.39	$ 115.53	$ 107.52	$ 86.80	$ 152.60	$ 107.03	$ 98.46	$ 133.08	$ 112.53	$ 125.05	$ 148.11	$ 123.89	$ 122.88	$ 223.46	$ 120.01	$ 117.22	$ 116.99	$ 164.85	$ 111.00
Credits—Calf, manure, and herd	4.45	7.00	1.70	6.80	3.59	6.38	1.29	1.26	3.04	3.58	13.82	8.57	4.15	2.36	10.57	13.18	8.90	3.18	1.20	6.94
Net cost of whole milk	$ 117.19	$ 161.39	$ 113.83	$ 100.72	$ 83.21	$ 146.22	$ 105.74	$ 97.20	$ 130.04	$ 108.95	$ 111.23	$ 139.54	$ 119.74	$ 120.52	$ 212.89	$ 106.83	$ 108.32	$ 113.81	$ 163.65	$ 104.06
Credit for available skim-milk	10.77	11.49	10.38	6.25	8.62	11.59	6.86	10.70	14.53	10.25	10.01	11.69	14.15	14.16	15.74	12.22	12.27	10.08	12.11	7.67
Net cost of butterfat	$ 106.42	$ 149.90	$ 103.45	$ 94.47	$ 74.59	$ 134.63	$ 98.88	$ 86.50	$ 115.51	$ 98.70	$ 101.22	$ 127.85	$ 105.59	$ 106.36	$ 197.15	$ 94.61	$ 96.05	$ 103.73	$ 151.54	$ 96.39
Production of butterfat, pounds	216.1	200.4	166.6	115.3	179.7	223.2	141.3	223.5	324.9	211.6	262.0	258.5	268.0	231.1	367.8	252.1	217.3	197.7	261.0	183.5
Cost per pound of butterfat, cents	49.2	74.8	62.1	81.8	41.5	60.3	70.0	38.8	35.5	46.6	38.6	49.4	39.4	46.0	53.6	37.5	44.2	52.5	58.0	52.5

*Credit.

ation existing in the different factors entering into the cost of production. As will be noted, the table sets forth the cost per cow for the various items making up the total cost.

Dairies numbered 94–106 inclusive are located in Marin County, those numbered 257–281 inclusive are in Sonoma County.

Butterfat production costs ranged from 35.5 cents to 81.8 cents per pound in the district. Nine of the 19 dairies produced at a cost lower than the district average of 49.2 cents, the remaining 8 at a cost above the average.

3. ALAMEDA–CONTRA COSTA–SANTA CLARA DISTRICT

Brief Description of Area

Complete and satisfactory records covering a full year's business were collected from 20 dairies located in the counties of Alameda, Contra Costa, and Santa Clara under similar and comparable conditions. Record taking was started with 32 dairymen but 12 were dropped for various reasons. These 20 dairies were selected from a rather wide territory, being located 2 each at Pleasanton, San Lorenzo, Concord, and Santa Clara, and 1 each at Alvarado, Newark, San Pablo, Decoto, Livermore, San Leandro, Byron, Knightsen, Oakley, Milpitas, San Jose, and Sunnyvale.

The year covered by the record taking ran from January 1, 1922, on eight dairies, from February 1, 1922, on 11 dairies, and from March 1, 1922, on 1 dairy.

Lands utilized for dairying ranged in character from low lying swamp or marsh lands to rolling hills maintained for pasture. Level valley floors constituted a substantial portion of the holdings, these lands being cropped to alfalfa and to a little grain, corn, and similar crops for the dairies. Some cropping was also practiced on some of the rolling hills. In size the holdings varied from one dairy setting aside only land enough for the cow corrals and dairy buildings, all feed being purchased and brought to the dairy, to a holding of 1000 acres. In all, these 20 dairies utilized a total of 6104 acres. Four of the dairies used less than 100 acres of land each, 12 from 100 to 500 acres, and 4 from 500 to 1000 acres. A few of the dairies possessed lands maintained solely for pasturing, but generally pasturing supplemented the raising of crops. Because of the variable nature of the pasture, from swamp to hills with a substantial amount of pasturing of crops, use of pasture was reported in the entire district at all times of the year. Pasturing of alfalfa was confined to the late

spring, summer, and early fall months, hill pastures gave best results during the spring months, while the swamp and overflow lands contributed pasture more or less during the spring, summer and fall months.

Feeding practices varied greatly in this district because topographical variations influenced the kinds of crops which could be grown. Natural hill pasture for the milking strings was reported by three men, with five more reporting similar pasture for dry cows only. Natural lowland and swamp pasture for the milking strings was utilized by six men, with one more using such for his dry cows. Six men reported the use of alfalfa pasture. Grain stubble pasture was utilized by three men.

Natural hill pasture was obtained in the fall, after the rains began, and in the late spring. The lowland and swamp pasture season ran through most of the year for the dry cows and generally during April, May and part of June for the milking strings. Alfalfa was pastured from April to September. The greatest reliance for dry forage was placed on alfalfa hay, 17 of the 20 dairymen reporting its use. Volunteer oat hay was used by 13 men, chiefly in combination with alfalfa. Oat, barley and grass hays were used in small amounts. Hay was generally fed throughout the year, although in some cases it was supplanted for a few months during the summer by pasturage or green feeds. Eight of the 20 dairymen made use of some kind of silage, 6 utilizing corn, 3 oat, 2 alfalfa, and 1 sunflower. Several of these 8 men fed a mixture of 2 or 3 kinds. Feeding of silage was generally confined to the winter months. Two men made use of pea vines, 2 of corn fodder, and 1 each used a small amount of mangels, beet tops, beets, brewers' grains, and spinach.

Alfalfa cut and fed green was reported by 8 men. The feeding of concentrates was generally practiced in the district. Twenty dairymen reported the use of 22 kinds of concentrates. The general practice was to feed 2 or 3 kinds at a time. During the year a great deal of changing about from one kind to another occurred, chiefly due to high prices of certain of the staples. Although only 2 or 3 kinds were used at a time, 1 dairyman reported the use of 8 kinds during the year, 2 of 6 kinds and 7 of 4 kinds. Coconut meal, barley, and beet pulp were the favorite concentrates, 16 men using the first, 13 the second and 11 the third. Six men reported the use of rice meal; 8 of various mill feeds; 3 each of molasses, molasses meal, linseed oil meal and bran; 2 each of corn, alfalfa meal, mixed feed, and cottonseed meal; and 1 each the use of mill run, cracked wheat,

chop, grain mixture, shorts and molasses screenings. Concentrates were fed by a majority of these dairymen the year round, although those who had alfalfa pasture or soiling crops temporarily discontinued the use of concentrates when these other feeds were available.

A total of 2782 cows were maintained on an average in these 20 dairies during the year covered by the record taking. The size of the individual herds ranged from 23 to 334 milking cows. Three dairies possessed less than 40 cows, one containing 23, the other two 24 head each. Six more dairies had less than 100 cows, containing respectively 48, 54, 62, 73, 84, and 92 head each. Six dairies were made up of from 146 to 196 animals, 4 dairies of from 211 to 265, and 1 of 334 cows. The average of all the herds amounted to 139 cows.

The Holstein breed predominated, 12 of the 20 herds being outstandingly Holstein, while 7 additional dairies had a generous proportion of Holsteins. One herd consisted of Shorthorns, 5 of Holsteins and milking Shorthorns, and 1 of Jerseys and Holsteins.

Seventeen of these 20 dairies possessed purebred bulls, numbering 38, of which 29 were registered. Of these 38 bulls, 2 were Shorthorns, the remainder Holsteins. All but 2 of the 17 dairies possessing purebred bulls had all or a part of their sire stock registered. A total of 125 registered cows, all Holsteins, were reported from 5 dairies.

On the majority of dairies cows are bred to freshen at all times, although two dairymen practiced breeding to have cows freshen either from July to February or during the winter months.

Milking is mostly done at 12-hour intervals. Hours of milking are variable, 1 dairyman milking at 3 o'clock, 3 dairymen at 4, 2 at 4:30, 3 at 5, 2 at 6:30, and 9 at 7 o'clock. Milking machines were in use on six dairies, the others relying on hand milking.

America, Switzerland, and Portugal were claimed as their mother countries by the dairy operators, while the nationalities of the milkers included Americans, Swiss, Germans, Scotch, Portuguese, Italians, Hollanders, Russians, and Frenchmen.

Dairymen in this district are concerned solely with the production of whole milk. Occasionally a little separating is done to provide cream for retail trade, but in every instance production of milk for the consuming public of the bay cities is the goal. Sales are made through a number of channels. Three of the dairymen retailed a whole or a large portion of their output. Two or three more supplied institutions, especially hospitals. Others sold their output through the Associated Milk Producers of San Francisco, the Walnut

Grove Creamery of Oakland, the Berkeley Farm Creamery, the Gordan Creamery of Berkeley, the Central Shuey Creamery, the Highland Farm dairy, the East Bay Milk Producers Association, the Fenton Creamery Company of Oakland, and others.

The personnel of the operators of these 20 dairies included 13 owners, 4 superintendents, and 3 tenants.

Summary of Costs

The cost of producing whole milk on 20 dairies supplying the bay region with milk and cream is summarized in the following table, all items entering into the cost of production being set forth in sufficient detail to provide a background for a better understanding of the expenses incurred by these dairymen in producing dairy products under conditions as they exist in Alameda, Contra Costa, and Santa Clara counties.

TABLE 7

COST OF MILK PRODUCTION SURVEY—ALAMEDA, CONTRA COSTA, SANTA CLARA COUNTIES

Number of dairies	20	
Number of cows	2782	
Number of bulls	63	
Costs		
Operating		
Labor		
Man—manual, 343,252 hours	$131,208.60	
Man—management	27,906.00	
Horse, 66,677 hours	5,331.73	
Truck and automobile, 96,585 miles	7,390.70	
Insurance	1,079.11	
Gross labor cost	$172,916.14	
Credits		
Net cost of labor		$172,916.14
Feed		
Pasture	$34,662.20	
Hay, 8159.95 tons	118,005.26	
Concentrates, 2,704.77 tons	76,049.08	
Silage, 1,699 tons	8,178.16	
Green feed, 9,563 tons	29,618.69	
Miscellaneous, 313 tons	1,115.60	
Insurance	265.00	
Total feed cost		267,893.99
Hauling milk		41,604.55
Supplies, cow testing, etc.		12,860.49
Interest on operating capital, $39,340 @ 6%		2,360.40

Herd charge		
Interest on average investment in cattle, $289,800.80 @ 6%	17,388.08	
Depreciation	15,023.70	
Mortality: 123 cows, $10,980.62; 2 bulls, $150	11,130.62	
Taxes	2,671.38	
Insurance	50.00	
Gross herd charge	$46,263.78	
Credits and appreciation	3,074.00	
Net herd charge		43,189.78
Buildings charge		
Interest on average investment of $213,082.19 @ 6%	$12,784.93	
Depreciation	8,878.23	
Upkeep	1,883.32	
Taxes	1,087.56	
Insurance	859.99	
Total buildings charge		25,494.03
Corral charge		
Use of land, including taxes	3,209.00	
Interest on investment in improvements, $43,927.09	2,635.63	
Depreciation of improvements	3,068.08	
Upkeep	69.90	
Total corral charge		8,982.61
Equipment charge		
Interest on average investment of $31,764.16	$1,905.84	
Depreciation	8,104.97	
Upkeep	3,413.07	
Taxes	215.80	
Insurance		
Total equipment charge		13,639.68
Total gross cost		588,941.67
Credits		
Calves, 1726	$10,896.85	
Manure	11,857.65	
Total credits	$22,754.50	
Net cost of whole milk		$566,187.17
Total production of whole milk		19,973,201 pounds
Cost per hundredweight of whole milk		$2.83
Total production in gallons of whole milk		2,322,466 gallons
Cost per gallon of whole milk		24.4 cents
Average annual production per cow		7180 pounds 835 gallons

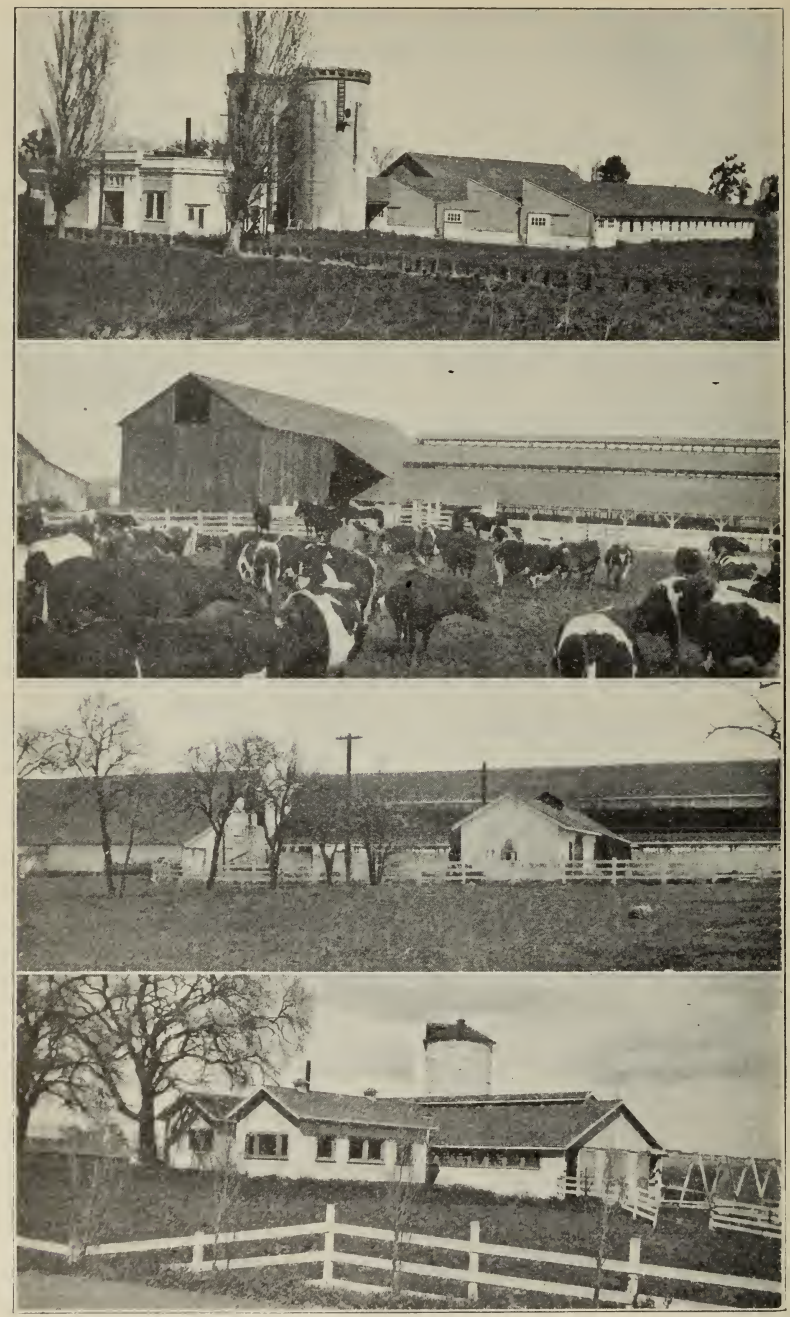

Fig. 7.—Dairy building equipment of Alameda, Contra Costa, Santa Clara counties where cost studies were conducted. The two top and the two bottom views each apply to the same dairy.

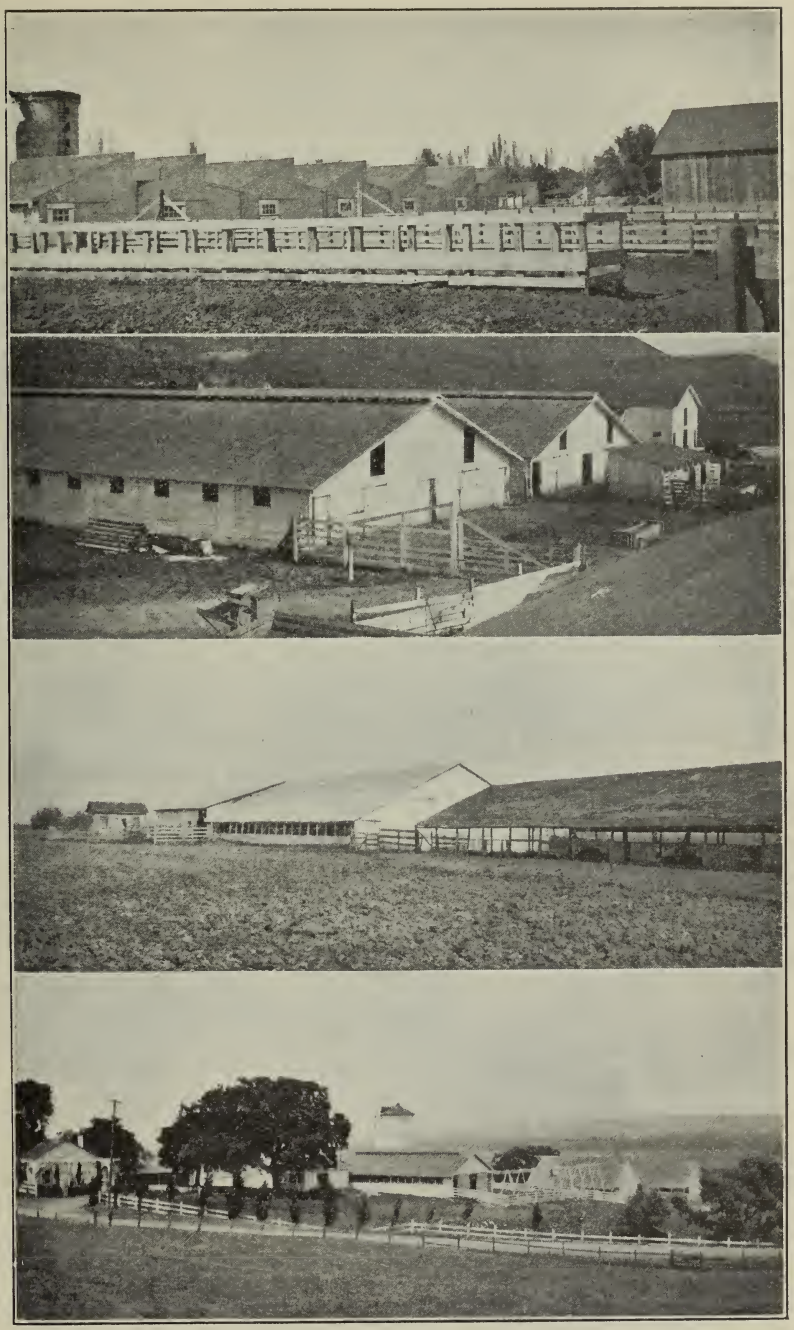

Fig. 7.—(*Continued.*)

Comments on Cost Findings

The twenty herds under observation in Alameda, Contra Costa, and Santa Clara counties were assessed for $97,385. Dairy buildings were assessed for $40,000. Dairy equipment assessments amounted to $7615. Tax rates per $100 of assessed values varied from $2.32 to $3.78. Total taxes paid amounted to $2,671.38 on dairy herds, $1087.56 on dairy buildings, and $215.80 on dairy equipment.

Insurance was carried on buildings by 18 of these 20 dairymen, employers' liability insurance by 7, cattle insurance by 1, and feed insurance by 3.

Manual labor used in producing the dairy output on these dairies cost an average of 38.2 cents per hour. A management charge for the time of the operator spent in administrative details amounted in all to 21 per cent of the manual labor expenditure, all dairymen reporting time spent in this way. Fifteen of these 20 dairies utilized horse labor in connection with the work of the dairies. The cost an hour ranged from 3 cents to 16.6 cents an hour for all work done, averaging for the 66,677 hours spent on the dairies close to 8 cents an hour.

Twelve trucks and 5 automobiles were used to some extent in carrying on the work of ten of these dairies. The cost per mile for all work done ranged from 2.3 cents to 16.2 cents a mile, averaging 7.6 cents a mile for the total of 96,585 miles that these machines were used in dairy work.

Eighteen of these 20 dairymen used pasturage, the cost per cow per year amounting to $14.14 for the dairies having stock on pasture. The ton cost of other feeds used on these dairies averaged for the year under study: hay $14.46; concentrates $28.22; silage $4.81; green feed (alfalfa and pea vines) $3.10; straw $2.33; mangels $4.04; corn fodder $4.00; wet brewers' grains $3.23.

Fifteen of the twenty dairies paid cash for contract hauling of their dairy products, total expenditures amounting to $41,604.55. In addition outlays of $12,860.49 for supplies, cow testing, and similar items were made by all these dairymen. Moneys required as operating capital totaled $39,340 for the twenty dairies, varying from $200 to $5000 for the different dairies.

The average investment in milking herds for the year that these dairies were under observation amounted to $289,800.80, of which $10,766 was invested in bulls and the remainder in cows. Bulls therefore made up 3.6 per cent of the total investment and cows 96.4 per cent. Average cow values of individual herds varied from $75 to $156 per head, and averaged close to $108 each. Bulls were valued at from $30 to $1000, averaged about $171, with eight of the 63 bulls in the district priced at $100 or less, and six valued at $300 or more.

Cow values of 7 of the 20 herds appreciated in value during the year, while 13 depreciated. Two herds showed appreciation of bulls, while 18 suffered some depreciation. Total net depreciation of cows amounted to $8,065.55, total depreciation of bulls to $3,928.65, a total depreciation for the herds of $11,994.20.

During the year involved in the record taking the mortality losses from the milking herds on these 20 dairies totaled 123 cows valued at $10,980.62 and 2 bulls valued at $150, a total mortality loss of $11,130.62. Based on the average number of cows maintained by these dairies this amounted to 4.4 per cent and to 3.2 per cent of the number of bulls. The average value of the cows dying amounted to $89.27, or a little more than 82 per cent of the average value of all cows maintained in the milking strings.

Dairy building equipment on the 20 dairies studied in this district consisted of 22 milking barns, 2 dairies having 2 each, 10 cow sheds on 9 dairies, 19 milk-

houses, 1 feed barn, 4 bull barns, 9 silos on 6 dairies, 3 granaries, 17 hay warehouses on 15 dairies, 2 tankhouses, 1 wash house, and 2 garages maintained for the dairy. The investment in these structures ranged from $1175 to $32,278.37, averaging $9890.12. The investment on 7 dairies ran from $1175 to $5000, on 4 dairies from $5000 to $10,000, on 5 dairies from $10,000 to $20,000, and on 4 dairies in excess of $20,000. Sums for upkeep were spent by fifteen dairymen, varying in amounts from $2 to $452.26, and totaling $1883.32. These expenditures amounted to practically 1 per cent of the investment. The depreciation total was $8878.23, or 4.5 per cent of the amount invested.

Lands required for corrals and dairy buildings amounted to 143 acres, acreages utilized by the different dairies varying from 1 to 30 acres. This land was given a rental rate of $3209, or $22.44 an acre a year. The investment in improvements such as corral fences and watering facilities, amounted to $43,927.09 for the 20 dairies, varying from $241.12 to $11,356.75. Six dairymen made expenditures for upkeep, ranging from $3.30 to $35.15 and totaling $69.90. This is equivalent to less than 0.2 of 1 per cent of the investment. Depreciation of these improvements amounted to $3068.08, or close to 7 per cent of the investment.

Dairying equipment reported as being in use consisted of 15 milking machines on 7 dairies, 86 milk cans, 9 pumps and engines, 17 wash vats, 15 milk coolers, 19 milk receiving tanks, 16 boilers, 37 hay trucks, 28 feeding buckets, 11 clipping machines, 17 motors, 3 hoppers, 23 wheelbarrows, 8 motors and refrigerating plants, 1 pasteurizer, 24 feed mixing vats, 2 ice pans, 3 milk testing outfits, 9 wagons, 131 milk pails, 6 separators, 44 lanterns, 5 veterinary outfits, 2 sterilizers, and a complete assortment of shovels, brooms, brushes, hose, forks, and similar minor items. Investment in dairying equipment varied from $61.47 to $5217.91, totaled $31,764.16, and averaged $1588.21. Nineteen dairymen spent various sums for upkeep, ranging from $4 to $559.32, and totaling $3413.07. Upkeep costs therefore amounted to 10.7 per cent of the investment in such equipment. Depreciation amounted to $8104.16, or 25.5 per cent of the investment.

Miscellaneous returns consisted of receipts from sales of sacks and of bull service, the former giving a credit of $678.04, the latter of $44.50.

A total of 1726 calves were reported as having a value for rearing or vealing, at the time when the dam's milk became fit for human consumption, amounting to $10,896.85, or $6.31 a head. The bulk of these calves were reported as being worth from $4.50 to $7.75, although 13 were given a value of $50 a head.

Three dairies made sales of manure produced, while the rest assigned a value of the material for ranch use. The total value of the manure produced was set at $11,857.65, of which $633.65 worth was sold.

Total production on these 20 dairies amounted to 19,973,201 pounds of whole milk, of which 92 per cent was sold and the balance used at the dairies. In terms of gallons, the common local way of reporting yields, this amounted to 2,322,466 gallons, of which 2,137,296 gallons were sold.

The average production for the 2782 cows recorded in this study amounted to 7180 pounds of whole milk, or 835 gallons per cow per year. The lowest herd average was 4301 pounds, or 500 gallons per cow annually; the highest 9816 pounds or 1141 gallons. Of the 20 herds, 13 were below the average, with 7 contributing amounts sufficiently high to maintain the figure of 7180 pounds.

Based on actual sales of whole milk made by these 20 dairies during the year that the record taking was under way, the average net price received amounted to $2.50 per 100 pounds of milk, or 21.6 cents per gallon, delivered at the creamery.

TABLE 8

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE ALAMEDA, CONTRA COSTA, AND SANTA CLARA DISTRICT

Dairy No.	Aver. of Dist.	2	3	4	6	7	9	10	12	13	14	16	17	18	21	23	226a	227	228	229	230
No. of cows	2782	177	256	92	334	23	24	84	48	73	146	196	62	54	147	258	211	24	156	152	265
Cost items:																					
Labor	$62.15	$57.68	$64.15	$44.52	$86.17	$48.91	$62.00	$75.79	$86.25	$63.41	$74.61	$64.93	$69.10	$60.37	$60.00	$54.63	$57.19	$99.88	$62.70	$40.84	$41.99
Feed	96.30	77.89	126.11	63.67	70.93	52.46	66.50	82.07	127.80	78.94	79.05	109.64	101.63	105.58	55.12	130.97	90.69	146.44	113.46	137.69	84.82
Minor items	20.43	23.01	18.32	5.53	4.52	2.67	1.23	29.91	5.70	16.58	15.30	29.07	10.63	19.50	24.78	34.19	25.39	6.09	24.24	23.98	26.13
Herd charge	15.52	15.77	15.05	4.74	10.35	12.10	12.54	16.86	24.33	29.29	16.38	5.56	24.02	46.64	13.20	21.81	*3.64	6.86	14.66	20.05	28.54
Building charge	9.16	4.06	7.37	3.48	8.58	6.61	7.24	18.07	29.89	8.43	9.11	8.40	10.22	14.93	6.90	10.75	16.41	8.89	2.85	7.58	8.79
Corral charge	3.23	3.25	1.41	.83	2.64	7.32	3.81	6.63	5.02	4.91	3.08	4.87	1.49	2.93	2.27	3.25	4.05	5.23	1.66	2.90	4.40
Equipment charge	4.90	1.63	2.38	1.53	3.28	4.07	1.54	13.15	4.08	1.31	.84	10.29	4.44	14.82	4.29	10.15	5.17	6.22	1.40	4.79	5.00
Total gross cost	$ 211.69	$ 183.29	$ 234.79	$ 124.30	$ 186.47	$ 134.14	$ 154.86	$ 242.48	$ 283.07	$ 202.87	$ 198.37	$ 232.76	$ 221.53	$ 264.77	$ 166.56	$ 265.75	$ 198.90	$ 279.61	$ 220.97	$ 237.83	$ 199.67
Credits—Calf, manure, herd	8.18	7.11	7.53	4.47	7.02	9.61	7.00	14.61	12.54	7.21	7.39	9.29	7.57	26.39	3.64	7.91	11.69	11.03	8.40	7.01	8.90
Net cost of whole milk	$ 203.51	$ 176.18	$ 227.26	$ 119.83	$ 179.45	$ 124.53	$ 147.86	$ 227.87	$ 270.53	$ 195.66	$ 190.98	$ 223.47	$ 213.96	$ 238.38	$ 162.92	$ 257.84	$ 187.21	$ 268.58	$ 212.57	$ 230.82	$ 190.77
Production of whole milk	7180	6900	7942	4301	7162	5100	6950	6644	7854	7091	8736	6704	6045	5491	5562	7715	7112	9816	7912	7090	7784
Cost per hundredweight of whole milk	$2.83	$2.55	$2.86	$2.79	$2.51	$2.44	$2.13	$3.43	$3.44	$2.76	$2.19	$3.33	$3.54	$4.34	$2.88	$3.34	$2.63	$2.72	$2.69	$3.26	$2.45
Production in gallons	835	802	923	500	833	593	808	773	913	825	1016	779	703	638	658	897	827	1141	920	824	905
Cost per gallon, cents	24.4	21.9	24.6	24.0	21.5	21.0	18.3	29.5	29.6	23.7	18.8	28.7	30.4	37.3	24.7	28.7	22.6	23.4	23.1	28.0	21.1

* Credit.

Costs of Production by Individual Dairies

Table 8 gives in detail the costs per cow involved in the production of milk on each of the 20 dairies where cost studies were completed for an entire year. Variation in costs as between different dairies and between different sections is shown in the data presented below.

Dairies numbered 2, 3, and from 6 to 14 inclusive are in Alameda County, dairies numbered 4, and 16 to 23 inclusive are in Contra Costa County, while dairies numbered 226A to 230 inclusive are in Santa Clara County.

The table shows that the range in the cost of producing milk was from a low of $2.13 to a high of $4.34 a hundredweight of milk. On a gallon basis, the range was from 18.3 to 37.3 cents. The district average was $2.83 per 100 pounds, or 24.4 cents a gallon. Of the 20 dairies, 10 were producing at or below the district average.

4. SACRAMENTO–YOLO DISTRICT

Brief Description of Area

The request for a study of the cost of producing whole milk and butterfat had its inception in Sacramento and Yolo counties. Cooperation in this district was such that 41 dairies supplied data in such shape that they could be included in summing up the year's work. Of the number, 20 were in Sacramento County, 18 were in Yolo County, while 3 were in San Joaquin County but so close to the Sacramento County boundary line and so similar in character that they could be included with the Sacramento-Yolo dairies. These 41 dairies were distributed over a fairly extensive territory, 5 being located at Elk Grove; 5 at Woodland; 5 at Clarksburg; 3 each at Galt, Sacramento, Thornton, and Freeport; 2 each at Davis, Esparto, Winters, and Natomas; and 1 each at Broderick, Knight's Landing, Franklin, Madison, Rio Linda, and Wilton.

Eight of the records ran from January 1, 1922, to January 1, 1923, 13 for the full year beginning from February 1, 1922, and 20 for the year beginning March 1, 1922.

These 41 dairies utilized 9163 acres. Nine of the 41 possessed some land maintained solely as pasture—swamp, brush, hill, hardpan land, or overflow. The pasture land amounted to about 2940 acres, or 32 per cent of the total. The remainder of the land consisted of alfalfa and grain, under irrigation, and was utilized for the pro-

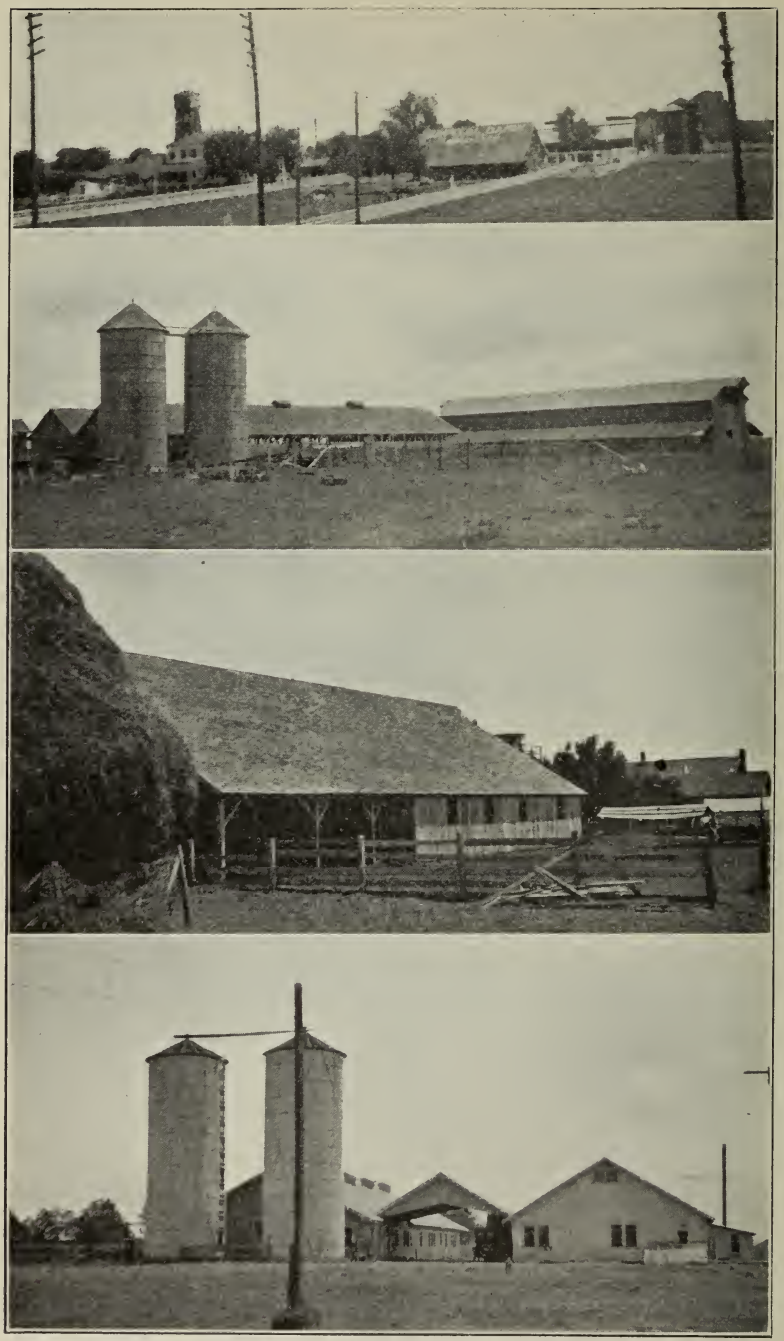

Fig. 8.—Typical dairy layouts of the Sacramento-Yolo district.

Fig. 8.—(*Continued.*)

duction of crops, to be either cut or fed off. The size of the holdings ranged from 25 to 2219 acres, but of the total all but two contained 400 acres or less. The most common size ranged 100 acres or less. The two biggest holdings were 1700 and 2219 acres respectively, with 1100 and 1385 acres of each in pasture. Thirty-two of the total possessed no pasture land, relying wholly upon irrigated crops and purchased feed. These 32 possessed dairy holdings averaging 192 acres, with 16 containing 80 acres or less.

Alfalfa is the foundation feed on all these dairies, being fed as hay, as pasture, or else cut green and hauled to the cows. All dairymen fed some alfalfa. Other hays were of little moment. Four men used a little oat hay, and a single dairyman barley hay. The majority of the dairymen fed alfalfa hay the year round, occasionally skipping a month or two. A few fed for shorter periods. Whenever alfalfa or other pasturage was available, the cows were turned upon it, many of the dairymen feeding some on pasture the year round, with others utilized pastures for shorter periods. One dairyman fed a small amount of green Sudan grass, while Sudan grass pasture in connection with alfalfa pasture was utilized by three dairymen. Only two dairymen did no pasturing. Green alfalfa or silage, or both, were fed by 24 dairymen, green alfalfa being confined to the growing months, with silage utilized during the season when growing crops were short. This meant the feeding of green alfalfa during the late spring, summer, and early fall months, and the turning to silage for the months of October to April, in one or two cases starting a month earlier and continuing two months later. Four dairymen made use of roots such as carrots and beets, and of pumpkins. Two dairymen fed some bean straw during the fall months. Feeding of concentrates was confined to 17 of the 41 dairymen, and of these only 2 fed consistently throughout the year. The other 15 confined grain feeding to a few months out of the year, often to less than 3 months, and seldom over 6 months. Concentrates used, in order of greatest favor, were barley, beet pulp, rice by-products, coconut meal, mill feeds, bran, and scattering use of alfalfa meal, oil cake, rolled oats, middlings, molasses meal, and corn meal.

The number of cows comprising these 41 herds totaled 2912 for the year covered by the study. Herds varying greatly in size were represented. Beginning with a herd averaging 20 during the year, there were 9 herds averaging less than 30 cows for the year, 8 of from 31 to 38, 6 of from 41 to 47, 3 of 51, 54, and 57, 5 of from 62 to 68, and 1 each of 73, 79, 82, 104, 153, 178, 179, and then a jump to 377 and 397. The average of all the herds, excluding the last two, amounted to 53.

The Holstein was the only breed reported for thirty herds, one of these being made up entirely of registered cattle. Four herds were reported of Holstein and Shorthorn, two of Jerseys, three of Holsteins, Jerseys, and Shorthorn, and two of Holsteins and Jerseys.

Twenty-nine of the dairymen had registered herd bulls, totaling 47 in number, while 5 additional dairymen were using purebred bulls, totaling 5 in number. This gives a total of 82 per cent purebred bulls. Of breeds, all but one were Holsteins, the exception being a Jersey. In addition to the bulls, 184 registered Holstein cows were reported from 5 herds.

All but two dairymen practiced all-year round breeding in order to maintain at all times about the same number of milking cows. The two exceptions bred for fall calves.

Milking was done twice a day at 12-hour intervals, most of the herds being milked between 3 and 5 A.M., and again at the same hours in the afternoon. Two herds were milked on the 2:30 hours, two at 6 and one at 7. Six of the dairies used milking machines, the balance relying upon hand milking.

Most of the operators gave their nationality as American. In addition, there were four Swiss, one German-American, and one Italian reported. While the use of American milkers was generally reported, there was also a sprinkling of other nationalities such as Swedish, Swiss, Italian, Portuguese, German, and Belgian.

Production was fairly evenly divided between the dairymen producing whole milk for sale as such and those separating and selling the butterfat in cream. Of the 41 dairies covered by this study, 18 confined their operations to the production of whole milk, 17 to butterfat production, and 6 sold both ways. During the year, sales were made to the Northern California Milk Producers Association, to the East Bay Creamery, Grand Royal Ice Cream Company, Sacramento Valley Creamery, Central Creameries of San Francisco, Glenn Dairy, Johnson Dairy of Sacramento, Crystal Creamery and Butter Company of Sacramento, and to the Sego Condensary at Galt.

Twenty of the operators owned the dairies that they were handling, while fourteen were in possession as tenants of the land and in one or two instances of the cows as well.

Summary of Costs

Table 9, immediately following, shows the summarized costs of producing whole milk and butterfat on 41 dairies in Sacramento and Yolo counties, where year round studies were conducted. Sufficient detail has been included to indicate the character and the amounts of the various items entering into dairy production costs of this section.

TABLE 9

COST OF MILK PRODUCTION SUMMARY—SACRAMENTO-YOLO COUNTIES

Number of dairies	41	
Number of cows	2912	
Number of bulls	63	
Costs		
Operating		
Labor		
Man—annual, 366,657 hours	$119,297.93	
Man—management	14,938.56	
Horse, 43,933 hours	3,702.32	
Use of truck and automobile, 45,270 miles	3,519.52	
Liability insurance	1,081.00	
Total labor cost		$142,539.33
Feed		
Pasture	$30,571.79	
Hay, 9806.33 tons	135,466.07	
Concentrates, 681.035 tons	20,818.58	
Silage, 3989.6 tons	23,529.95	
Green feed, 6,987 tons	23,818.00	
Roots, 214½ tons	747.50	
Bean straw, 30¾ tons	137.75	
Insurance	661.40	
Total feed cost		235,751.04
Hauling milk and cream		16,573.96
Supplies, cow testing, etc.		10,290.87
Interest on operating capital, $26,179 @ 6%		1,570.74
Herd charge		
Interest on average investment in cattle, $327,226.58 @ 6%	19,633.59	
Mortality: 155 cows, $14,582; 7 bulls, $1,400	15,982.00	
Taxes	3,024.30	
Gross herd charge	$38,639.89	
Credits and appreciation	2,320.99	
Net herd charge		36,318.90
Buildings charge		
Interest on average investment of $219,070.00 @ 6%	$13,144.20	
Depreciation	10,654.00	
Upkeep	7,786.38	
Taxes	1,960.63	
Insurance	1,745.01	
Total buildings charge		35,290.22

Corral charge		
Use of land, including taxes, 209.1 acres	$3,780.75	
Interest on investment in improvements, $51,346.75 @ 6%	3,080.80	
Depreciation of improvements	4,487.50	
Upkeep	1,199.80	
Total corral charge		12,548.85
Equipment charge		
Interest on average investment of $15,758.34 @ 6%	$945.50	
Depreciation	2,632.72	
Upkeep	4,201.30	
Taxes	200.17	
Insurance	67.22	
Total equipment charge		8,046.91
Total gross cost		498,930.82
Credits		
Calves, 2,534	$16,881.00	
Manure	7,329.00	
Total credits	$24,210.00	
Net cost of whole milk		$474,720.82
Total production of whole milk		19,261,250 pounds
Cost per hundredweight of whole milk		$2.46
Total production of butterfat		671,202.03 pounds
Total cost of butterfat in cream		
Cost of whole milk		$474,720.82
Credit for skimmilk, 175,362.32 hundredweight @ 25 cents per 100 pounds		43,840.58
Cost of butterfat in cream		$430,880.24
Cost per pound of butterfat in cream		64.2 cents
Average annual production per cow		6614 pounds of whole milk 230.5 pounds of butterfat

Comments on Cost Findings

The 41 herds covered in making a year's study of the cost of producing whole milk and butterfat in Sacramento and Yolo counties were assessed a total of $84,985 for taxes. Dairy structures were assessed for $51,418.50, and dairy equipment for $4340. Tax rates in this district varied from $2.60 to $5.16 per $100 of assessed value. Total taxes paid by this group of dairymen amounted to $3,024.30 on cattle, $1,960.63 on dairy structures, $200.17 on dairy equipment, and $180 on hay and grain.

Insurance premiums were paid for coverage on buildings, employer's liability, dairy equipment, and feed. Dairy buildings were insured in all but two instances. Five dairymen carried employer's liability insurance, two insured their dairy equipment, and seven carried feed insurance.

To produce the output from these 41 dairies necessitated the use of manual labor to the amount of 366,657 hours, at an average cost of 32.5 cents per hour. Time expended by the operators in management details, reported for all dairies, totaled $14,938.56, thus amounting to 12.5 per cent, or ⅛, of the sums spent for manual labor.

Thirty-seven of these 41 dairymen reported the use of horses in connection with the handling of the dairy, the total time thus expended amounting to 43,933 horse hours, costing $3702.32. The average cost for all work done by this work-stock on the various dairies averaged 8.4 cents per hour, but varied from 5.2 to 22.7 cents per hour.

Eight automobiles and five trucks on as many dairies were used in connection with the work of the dairy. The cost per mile, based on all work done by these machines, averaged 7.8 cents, varying from 3.6 to 13.3 cents a mile. The dairies utilized these machines to the extent of 45,270 miles at a total cost of $3,519.52.

All but two dairymen reported the use of pasture, the total cost amounting to $30,571.79. Based on the number of cows carried by the dairies possessing or buying pasturage, the average cost per cow for the year amounted to $12.27. The costs per ton of other feeds used during the year averaged for the period when these studies were conducted: Hay, $13.82; concentrates, $31.46; green feed, $3.41; silage, $5.90; roots, $3.49; bean straw, $4.48.

Thirty-six of these 41 dairymen paid cash for the hauling of their dairy output, the cost of this contract work amounting to $16,573.96. In addition, purchase of supplies, cow testing fees, veterinary services, and similar charges totaled $10,290.87, all dairymen finding it necessary to make expenditures of this nature. Operating capital amounted to $26,179, ranging from $22 to $10,000.

The investment in milking herds on these 41 dairies for the year that they were under observation amounted to $327,226.58, of which cow values made up $311,255, or about 95 per cent, bulls to the value of $15,971.58 making up the balance. Average values of cows ranged from a low in one herd of $55 to a high average in another herd of $200. Average cow values of 28 herds amounted to $100 or less per head. The average value of all cows was close to $107 per head. Bulls ranged in value from a low of $55 to $3750, averaging close to $250 a head. Of the 63 bulls reported for the district, 30 were priced at $150 or less.

Twenty-one of these 41 herds increased in cow values during the year, based on productive capacity, so that these dairies reflected an appreciation rather than a depreciation in cow values sufficiently high to offset the depreciation suffered by the other 20 herds, leaving a final figure of $7356.99 net appreciation. Seven herds reported bull appreciation, but total depreciation of the remaining herds was sufficiently high to make a net depreciation for this group of dairies amounting to $5,036. The total herd appreciation, on both cows and bulls, amounted to $2,320.99.

Thirty-two dairies lost cows from various mortality causes during the year that these cost data were being collected. The number lost totaled 155, valued at $14,582. Seven bulls on five dairies were lost, valued at $1400. Losses thus totaled 4.7 per cent of the cows and 11.1 per cent of the bulls maintained in the herds during the year. The average value of cows dying was $94.77, or not much below the average value of the total number of cows maintained in the herds.

Building equipment on these 41 dairies consisted of 48 milking barns, four dairies possessing 2 each, and one dairy 4; 42 milk houses; 47 shelter and feed

sheds, two dairies having 1 each, one 4, and one 10; and 39 silos, five having 2 each, one 6, and one 10. The investment in these structures varied on the different dairies from $433 to $46,932.50, totaled $219,070, and averaged close to $5343 per dairy. Of the 41 dairymen, 14 possessed less than a $2000 investment in dairy structures, 19 had from $2000 to $5000 invested, 3 from $5000 to $10,000, 2 between $10,000 and $20,000, and 3 in excess of $20,000. Thirty-one dairymen paid for various items of building upkeep, totaling $7786.38, and varying from $2.50 to $3242. Upkeep expenditures amounted to 3.6 per cent on the investment in dairy structures. Depreciation totaled $10,654, or 4.9 per cent of the investment.

A total of 209.1 acres of land was recorded as being required for corrals and dairy building sites. Rental value was set at a total of $3780.75, thus amounting to an annual charge per acre of $18.08. Investment in fences, watering facilities, sewage disposal systems, and similar improvements amounted to $51,346.75, ranging from $180.50 to $17,250.80, and averaged $1252. Seventeen dairymen spent sums ranging from $2.50 to $770 for upkeep of these improvements, totaling $1199.80, or practically 2 per cent of the investment in these items. Depreciation during the year amounted to $4,487.50, or 8.7 per cent of the investment.

Dairying equipment required by these 41 dairies consisted of 23 separators, 4 milking machines, 6 milk tanks, 25 milk vats, 8 can racks, 4 milk troughs, 5 heaters, 17 boilers, 8 stoves, 59 lanterns, 11 scales, 3 feed grinders, 1 ice plant, 4 milk trucks, 12 motors, 31 strainers, 19 coolers, 66 carts, 29 wheelbarrows, 7 manure pushers, 2 sprayers, 2 pumps, 9 gasoline engines, 145 forks, 59 brooms, 55 shovels, 43 wash tubs, 324 milk pails and buckets, 205 milk cans, 60 brushes, and a miscellaneous assortment of such items as hose, fire extinguishers, thermometers, axes, silage conveyors, cream agitators, milk testers, cowbells, clippers, pans, dippers, filters, clarifiers, whitewashing outfits, kicking chains, veterinary outfits, hobbles, hoes, manure stands, and various shafting, pulleys, and belts. Investment in this equipment totaled $15,758.34, averaged $384.34, and ranged from $21.65 to $1,803.97. Twenty of these 41 dairies had an investment in dairy equipment of less than $200 per dairy, thirteen had from $200 to $500 invested, and the remaining eight had in excess of $500 invested. All dairymen made expenditures for dairy equipment upkeep, totaling $4201.30, but ranging from $4 to $2076.20. The sum spent in upkeep was equivalent to 26.6 per cent of the investment. Depreciation amounted to $2632.72, or 16.6 per cent of the amount invested in dairy equipment.

Miscellaneous receipts were scattering and unimportant. Sales of feed bags and hides were the only items recorded, the former totaling $604, the latter $65.55.

A total of 2534 calves of the total number born were assigned a value by the dairymen upon whose dairies they appeared, amounting to $16,881 at the time that the dams' milk could be used for human consumption. This figures $6.67 per head, most of the dairymen considering calves of this age as being worth $5 to $10. The lowest assigned value was $2.50 each for 46 calves, the highest $30 each for 70 calves.

Two dairies reported sales of manure totaling $97.50. Of the two, one considered the manure of value only to the extent that he made sales, while the other ascribed value to that used on his own farm. In addition to these two, 27 dairymen considered the manure as having some value on their places, while 12 dairymen deemed the manure to be of no value. Total value of manure from the 2912 cows and 63 bulls amounted to $7329.

TABLE 10—Average Cost and Production per Cow for Individual Dairies in the Sacramento–Yolo District

Dairy No.	Ave. of Dist.	144	146	147	148	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	203
No. of cows	2912	377	36	33	68	79	21	35	45	178	44	20	47	31	54	23	82	153	397	26	31
Cost items:																					
Labor	$48.95	$49.76	$43.82	$53.49	$49.05	$48.56	$49.16	$41.71	$39.20	$50.24	$23.33	$65.69	$39.45	$67.53	$28.78	$64.88	$78.46	$37.80	$69.67	$59.54	$37.68
Feed	80.96	86.81	49.66	94.10	78.52	72.99	108.97	57.88	68.78	98.83	94.84	61.18	50.92	73.62	75.12	92.98	109.50	62.69	102.91	83.87	117.03
Minor items	9.77	16.18	22.00	10.24	15.88	6.32	25.36	13.78	13.01	5.94	8.76	13.56	4.79	3.97	3.26	5.35	4.91	14.40	5.87	4.14	13.36
Herd charge	12.47	8.65	39.35	15.24	37.67	.75	11.21	5.64	13.00	32.54	4.93	12.17	14.00	24.78	31.13	34.96	12.51	.15	16.06	29.51	17.92
Building charge	12.12	12.73	15.98	9.55	58.36	6.97	9.45	23.12	8.48	19.89	9.67	3.77	7.34	16.26	12.06	5.52	12.06	1.91	17.23	14.52	16.21
Corral charge	4.31	3.32	5.16	4.29	6.87	2.14	6.15	3.51	3.00	15.03	3.35	3.33	2.41	4.31	3.22	6.84	7.68	1.17	4.52	6.71	4.06
Equipm't charge	2.76	1.59	1.41	3.86	1.53	3.12	1.34	2.13	.62	3.88	5.21	1.12	2.03	1.70	1.91	1.82	3.30	1.05	6.52	4.22	1.83
Total gross cost	$ 171.34	$ 179.04	$ 177.38	$ 190.77	$ 247.88	$ 140.85	$ 211.64	$ 147.77	$ 146.09	$ 226.35	$ 150.09	$ 160.82	$ 120.94	$ 192.17	$ 155.48	$ 212.35	$ 228.42	$ 119.17	$ 222.78	$ 202.51	$ 208.09
Credits—Calf, manure, herd	8.32	8.86	7.15	17.33	12.12	9.94	9.57	10.89	8.35	13.76	7.61	9.00	3.81	5.80	9.85	2.74	5.09	5.55	8.89	16.21	9.44
Net cost of whole milk	$ 163.02	$ 170.18	$ 170.23	$ 173.44	$ 235.76	$ 130.91	$ 202.07	$ 136.88	$ 137.74	$ 212.59	$ 142.48	$ 151.82	$ 117.13	$ 186.37	$ 145.63	$ 209.61	$ 223.33	$ 113.62	$ 213.89	$ 186.30	$ 198.65
Production of whole milk, lbs.	6614	6197	5419	8386	7343	5611	8629	5457	5003	6666	4608	6911	5579	6497	4753	7706	6839	4966	9510	5984	7542
Cost per cwt. of whole milk	$2.46	$2.75	$3.14	$2.07	$3.21	$2.33	$2.34	$2.51	$2.75	$3.19	$3.09	$2.20	$2.10	$2.89	$3.06	$2.72	$3.27	$2.29	$2.25	$3.11	$2.64
Net cost of whole milk	$ 163.02	$ 170.18	$ 170.23	$ 173.44	$ 235.76	$ 130.91	$ 202.07	$ 136.88	$ 137.74	$ 212.59	$ 142.48	$ 151.82	$ 117.13	$ 186.37	$ 145.63	$ 209.61	$ 223.33	$ 113.62	$ 213.89	$ 186.30	$ 198.65
Credit for available skimmilk	15.05	14.19	12.40	19.07	16.70	12.81	19.67	12.45	11.39	15.09	10.47	15.93	12.74	14.75	10.84	17.39	15.49	11.35	21.59	13.61	17.21
Net cost of butterfat	$ 147.97	$ 155.99	$ 157.83	$ 154.37	$ 219.06	$ 118.10	$ 182.40	$ 124.43	$ 126.35	$ 197.50	$ 132.01	$ 135.89	$ 104.39	$ 171.62	$ 134.79	$ 192.22	$ 207.84	$ 102.27	$ 192.30	$ 172.69	$ 181.44
Production of butterfat, lbs.	230.5	204.1	188.3	293.5	264.3	194.2	296.8	190.1	169.6	250.6	161.2	229.4	195.2	237.1	166.3	285.2	242.8	173.8	328.1	209.1	273.1
Cost per pound of butterfat, cents	64.2	76.4	83.7	52.6	82.8	60.8	61.4	65.5	74.4	78.8	81.9	59.2	53.5	72.4	80.9	67.4	85.4	58.9	58.6	82.6	66.5

TABLE 10—(*Concluded*)

Dairy No.	204	205	293	294	295	296	297	298	299	300	301	303	305	307	309	310	311	312	313	314	317
Number of cows	27	41	180	62	38	37	63	78	66	33	33	24	57	104	63	51	46	29	26.	47	27
Cost items:																					
Labor	$55.57	$36.22	$41.24	$44.75	$47.45	$44.43	$40.21	$43.74	$56.61	$55.09	$45.49	$44.45	$25.71	$25.51	$39.79	$40.06	$36.94	$34.59	$79.52	$54.15	$54.39
Feed	91.52	103.91	72.54	87.18	88.38	87.90	52.68	64.46	61.61	73.13	71.30	105.63	55.66	26.50	76.10	96.63	53.90	62.03	114.64	83.20	79.02
Minor items	13.25	13.97	4.70	6.43	10.85	7.26	6.37	4.52	4.49	19.31	4.89	4.64	3.14	16.76	8.76	5.06	5.74	6.92	22.62	27.31	12.22
Herd charge	*10.24	39.14	*14.03	*10.36	10.44	9.48	21.81	9.74	18.85	28.50	38.88	*15.15	1.21	27.98	9.19	6.58	8.59	17.04	31.34	*27.05	3.84
Building charge	11.97	9.94	8.98	11.15	9.15	7.75	7.41	3.58	10.12	6.40	5.28	7.83	3.46	3.86	7.71	4.43	4.83	4.89	8.91	22.33	15.23
Corral charge	5.96	3.13	2.02	6.69	8.33	5.87	2.63	2.35	1.46	3.42	2.63	5.64	3.04	1.97	1.90	3.15	1.70	2.17	4.64	3.53	3.91
Equipm't charge	1.39	.70	3.06	2.92	1.98	2.06	1.79	1.58	1.47	1.35	.79	1.57	1.54	2.76	1.00	1.62	.87	1.41	2.04	2.76	6.98
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Total gross cost	179.66	207.01	132.54	159.12	177.58	164.75	132.90	129.97	154.61	187.20	169.26	169.76	93.76	105.34	144.45	157.53	112.57	129.05	263.71	193.28	175.59
Credits—Calf, manure, herd	19.60	5.56	24.37	20.52	5.26	6.62	4.60	8.56	5.46	4.93	7.27	25.19	2.02	4.85	6.26	6.17	12.17	4.48	6.92	33.75	5.44
Net cost of whole milk	$ 160.06	$ 201.45	$ 108.17	$ 138.60	$ 172.32	$ 158.13	$ 128.30	$ 121.41	$ 149.15	$ 182.27	$ 161.99	$ 144.57	$ 91.74	$ 100.49	$ 138.19	$ 151.36	$ 100.40	$ 124.57	$ 256.79	$ 159.53	$ 170.15
Production of whole milk, lbs	7321	7649	6172	6950	7778	7106	7178	5862	6005	5209	7541	5337	3208	4711	6299	4891	5370	6287	8375	7684	7773
Cost per cwt. of whole milk	$2.18	$2.63	$1.75	$1.99	$2.22	$2.23	$1.79	$2.07	$2.48	$3.50	$2.15	$2.71	$2.86	$2.13	$2.19	$3.09	$1.87	$1.98	$3.07	$2.08	$2.19
Net cost of whole milk	$ 160.06	$ 201.45	$ 108.17	$ 138.60	$ 172.32	$ 158.13	$ 128.30	$ 121.41	$ 149.15	$ 182.27	$ 161.99	$ 144.57	$ 91.74	$ 100.49	$ 138.19	$ 151.36	$ 100.40	$ 124.57	$ 256.79	$ 159.53	$ 170.15
Credit for available skimmilk	16.73	17.52	14.06	15.78	17.69	16.17	16.32	13.33	13.64	11.86	17.17	12.03	7.26	10.65	14.38	11.14	12.24	14.31	19.19	17.55	17.67
Net cost of butterfat	$ 143.33	$ 183.93	$ 94.11	$ 122.82	$ 154.63	$ 141.96	$ 111.98	$ 108.08	$ 135.51	$ 170.41	$ 144.82	$ 132.54	$ 84.48	$ 89.84	$ 123.81	$ 140.22	$ 88.16	$ 110.26	$ 237.60	$ 141.98	$ 152.48
Production of butterfat, lbs	250.4	257.0	216.0	243.2	271.8	248.7	251.2	205.1	210.1	182.8	263.9	206.0	114.8	172.7	214.1	171.2	188.1	220.0	277.2	264.3	272.1
Cost per lb. of butterfat, cents	57.3	71.5	43.6	50.5	56.8	57.1	44.6	52.7	64.5	93.4	54.9	64.4	73.5	52.0	57.8	82.0	46.8	50.1	85.7	53.7	56.0

*Credit

Of the 41 dairymen constituting the group from which cost data was collected during the year that these dairies were under observation, 17 sold whole milk exclusively, 17 sold butterfat exclusively, 6 sold both whole milk and butterfat, and 1 retailed his output. In all, these 41 dairies produced a grand total of 19,261,550 pounds of whole milk containing 671,202.03 pounds of butterfat. Individual herd test averages varied from 3.31 to 3.76 per cent butterfat in whole milk, the average test for the total production running close to 3.5 per cent. Of the total production, 92.4 per cent was sold and 7.6 per cent used at the dairy.

The average annual production of all the 2912 cows maintained during the year in these amounted to 6614 pounds of whole milk, or 230.5 pounds of butterfat per cow. The lowest herd average for the year amounted to 3208 pounds of whole milk containing 114.8 pounds of butterfat; the highest herd average reached a figure of 9510 pounds of whole milk per cow per year, containing 328.1 pounds of butterfat. Of the total 41 dairies, 22 registered an average herd production figure less than the district average for both whole milk and butterfat. Thirteen dairy herds of the 41 produced a yearly average to the cow amounting to 195.2 pounds or less of butterfat.

Based on receipts from sales obtained by dairymen selling either whole milk or butterfat exclusively, and on the wholesale market, the average net price received during the year under observation amounted to 45 cents per pound of butterfat sold, and $2.16 per hundred pounds of whole milk.

Costs of Production by Individual Dairies

For purposes of recording the variation in costs as experienced by the individual dairies of the 41 studied in Sacramento and Yolo counties, a table is inserted (table 10), setting forth the various items entering into the cost of producing milk on the different dairies.

Dairies numbered 144 to 165 inclusive are in Sacramento County; dairies numbered from 293 to 317 inclusive are in Yolo County; dairies numbered 203, 204, and 205 are in San Joaquin County, close to the Sacramento County line, and included with this district for reasons as set forth in the opening paragraphs.

The cost of production on the 41 dairies studied ranged from $1.75 to $3.50 per hundredweight of whole milk, and from 43.6 cents to 93.4 cents per pound of butterfat. The average cost for the district was $2.46 per hundredweight of whole milk and 64.2 cents per pound of butterfat.

Twenty dairies produced whole milk and butterfat above the average cost of the district, while the cost was below the average on 21 of the dairies.

5. SAN JOAQUIN–STANISLAUS DISTRICT

Brief Description of Area

Seventeen dairies contributed complete cost data in the San Joaquin-Stanislaus district. Eight of these dairies were located in Stanislaus and nine in San Joaquin counties. Six of these dairies were tributory to Ripon, five to Modesto, and one each to Lockeford, Escalon, Stockton, Hickman, Hughson, and Waterford. Conditions on these dairies were generally similar and the findings are deemed entirely comparable.

All records, with but one exception, ran from January 1, 1922. The exception covered the year from April 1, 1922.

These 17 dairies utilized a total of 1521 acres. The smallest holding consisted of but 3 acres, corral feeding being practiced. The largest holding consisted of 400 acres, of which 300 acres were rolling hills providing some grain and some pasturage. Twelve of the 17 holdings contained less than 50 acres, ranging from 3 to 49 acres, and averaging 25 acres. These places were invariably irrigated lands utilized for the growing of alfalfa, silage crops, and grain, sometimes being double-cropped during the season. The larger holdings, those having 100 acres or more, possessed some pasture land consisting of rolling hills.

Methods of feeding the milking herd varied somewhat on the different dairies, but in general consisted of corral feeding with alfalfa hay, some silage, and a limited amount of concentrates. Use of pasture was the exception rather than the rule. Thirteen dairymen reported no use of pasture whatever, while the remaining four had pasture for but limited periods, ranging from 1 to 7 months. Pasture was available during the spring and early summer months. Feeding of hay the year round was common. Thirteen dairymen fed hay 12 months, while one each fed for 11, 10, 9, and 6 months respectively. Alfalfa hay was outstandingly used, although four dairymen made some use of oat or wild grass, one dairyman using wild grass hay exclusively. Eleven of the dairymen fed silage for periods ranging from 1 to 11 months. Six of the eleven fed for 6 months or longer, feeding of silage being usually confined to the late fall, winter, and early spring months. Much variation existed in the feeding of concentrates both in periods when such feeds were given and in the amounts fed, some dairymen using rather limited quantities. Three dairymen fed the year round, seven fed from 6 to 11 months, four fed less than 5 months, and three fed no concentrates at all. Feeding

of concentrates when practiced for less than a full year was usually confined to the late fall, winter, and early spring months. Of ten different kinds of concentrates used by these dairymen, barley was most generally fed, thirteen dairymen feeding in quantity, with six of these using no other form of concentrate. Other feeds used for a month now and then were pumpkins, utilized by one dairyman, and bean straw, fed by another.

An average of 417 cows and 22 bulls were maintained on these 17 dairies during the year that these costs studies were in progress. The size of the individual herds ranged from 12 to 64, and averaged 25. Ten of the herds averaged 20 cows or less, while but one herd exceeded 38 in number, this being the 64-cow herd just referred to.

Jerseys, Guernseys, Holsteins, and one "mixed" herd were reported. Of the 17 herds covered by this study, 11 herds were of Holsteins, 2 of these herds being registered, 4 were Jerseys, 1 of which was registered, 1 was a combination of Jerseys and Guernseys, and 1 a mixed herd.

All but one herd were headed by purebred bulls, numbering 20 in all, of which 19 were registered. Of these 20, 12 were Holsteins, 5 Jerseys, and 3 Guernseys. Seven dairymen reported registered cows, six of the seven having a total of 107 head, including 68 Jerseys and 30 Holsteins.

Year round freshening of cows to insure a steady supply of milk was the rule, although three dairymen were attempting to secure the bulk of their fresh cows during the fall, winter, or early spring months.

While twice a day milking was the general rule, two dairies did some three times a day milking. Generally, milking took place at 12-hour intervals beginning at 5 or 5:30 A.M. Five of the 17 dairymen used milking machines, the others relying on hand milkers.

Nationalities of operators were stated to be American, Italian-Swiss, Swiss, and Hollander. Nationalities of milkers were Swiss, American, and Hollander.

All these dairymen were concerned with the production of butterfat either for sale in cream or as whole milk. Production of market milk did not enter into the situation. Milk sold whole was paid for on a butterfat basis, so for all practical purposes the district may be deemed as specializing in the production of butterfat. Sales were variously made to the Modesto Creamery; the Borden Condensary, at Modesto; the Hughson Creamery; the Swift Creamery, at Ceres; and to the Milk Producers' Association of Central California, at Modesto.

Fourteen of the 17 dairymen owned the dairy under their charge, while three were tenants.

Summary of Costs

The summarized cost of producing whole milk and butterfat on the 17 dairies studied in San Joaquin and Stanislaus counties is set forth, with considerable detail, in the following table.

TABLE 11

COST OF MILK PRODUCTION SUMMARY—SAN JOAQUIN AND STANISLAUS COUNTIES

Number of dairies	17	
Number of cows	417	
Number of bulls	22	
Costs		
Operating		
Labor		
Man—manual, 56,438 hours	$17,539.72	
Man—management	6,788.00	
Horse, 5,855 hours	479.96	
Truck and automobile, 180 miles	18.00	
Insurance	77.75	
Total labor cost		$24,903.43
Feed		
Pasture	$2,629.00	
Hay, 1,862.06 tons	22,429.17	
Concentrates, 187.53 tons	4,892.74	
Silage, 527.40 tons	3,120.08	
Miscellaneous, 5 tons	28.00	
Insurance	108.00	
Total feed costs		33,206.99
Hauling milk		2,857.65
Supplies, cow testing, etc.		2,376.32
Interest on operating capital, $3,581 @ 6%		214.86
Herd charge		
Interest on average investment in cattle, $68,304.00 @ 6%	$4,098.24	
Depreciation	3,818.25	
Mortality: 22 cows; 0 bulls	4,050.00	
Taxes	670.49	
Gross herd charge	$12,636.98	
Credits and appreciation	4,443.00	
Net herd charge		8,193.98
Buildings charge		
Interest on average investment of $33,215.17 @ 6%	$1,992.90	
Depreciation	1,329.65	
Upkeep	298.47	
Taxes	300.27	
Insurance	199.29	
Total buildings charge		4,120.58

Corral charge		
Use of land, including taxes	$617.50	
Interest on investment in improvements, $6,949.02 @ 6%	416.91	
Depreciation of improvements	624.90	
Total corral charge		$1,659.31
Equipment charge		
Interest on average investment of $4,927.14 @ 6%	$295.57	
Depreciation	930.43	
Upkeep	268.65	
Taxes	29.96	
Total equipment charge		1,524.61
Total gross cost		$79,057.73
Credits		
Calves, 353	$3,627.70	
Manure	1,790.00	
Total credits	$5,417.70	
Net cost of whole milk		$73,640.03
Total production of whole milk		2,798,145 pounds
Cost per hundredweight of whole milk		$2.63
Total production of butterfat		112,699.2 pounds
Cost per pound of butterfat in whole milk		65.3 cents
Total cost of butterfat in cream		
Cost of whole milk		$73,640.03
Credit for skimmilk, 25,167.10 hundredweight @ 25 cents per 100 pounds		6,291.77
Cost of butterfat in cream		$67,348.26
Cost per pound of butterfat in cream		60 cents
Average annual production per cow		6710 pounds of whole milk 270.3 pounds of butterfat

Comments on Cost Findings

The 17 herds studied throughout the year in San Joaquin and Stanislaus counties were assessed for $16,285. Dairy buildings were assessed for $7075, and dairy equipment for $710. Tax rates per $100 of assessed values ranged from $2.69 to $5.22. Total taxes paid amounted to $670.49 on cattle, $300.27 on dairy structures, and $29.96 on dairy equipment.

Dairy buildings were insured on all dairies, while five men carried employer's liability insurance, and five carried insurance on feed.

Manual labor used on these 17 dairies cost an average of 31.1 cents an hour. A charge for management was figured by each dairyman, totaling $6788, or nearly 30 per cent on the expenditures for manual labor.

Four dairymen utilized horse labor in carrying on the work of the dairies, the average cost for all work done by horses on these dairies amounting to 8.2 cents an hour. For the 5855 hours that horses were employed in connection with these four dairies, the charge amounted to $479.96.

Only one automobile was reported used in connection with any of the dairies and the use of this machine totaled only $18.

The value of pasturage used by six dairymen amounted to $2629, or, for the 216 cows pastured, averaged $12.17 a head a year. Per ton costs of other feeds used by this group of dairymen, during the year that these dairies were under observation, averaged: Hay, $12.05; concentrates, $26.09; silage, $5.92; pumpkins, $5; straw, $8.

All dairymen paid for contract hauling of their output, and, in addition, expended a total of $2376.32 for supplies, cow-testing fees, and similar items. Operating capital amounted to $3581, ranging from $50 to $415.

The average investment in milking herds amounted to $68,304, of which bulls made up $8512, or 12.5 per cent, with the cows contributing the balance. Cow values based on herd averages ranged from $100 to $381, although twelve herds were rated as being worth between $100 and $150, three herds between $165 and $172, with the two remaining herds valued at $350 and $381 per head, respectively. The average cow value was $163.80. Bull values varied from $75 to $1250 per head, with all but 2 of the 22 bulls reported for the district possessing a value of $150 or more.

Eight of the 17 herds studied in this district showed an appreciation during the year for the milking cows, while two showed appreciation of bull values. The net appreciation of cows amounted to $1415.25, the net depreciation of bulls to $791, this giving a net herd appreciation of $724.75.

During the year that these dairies were under observation, 22 cows died, valued at $4050. No bulls were recorded as dying. The average value per cow of those dying amounted to $184, or in excess of the average values reported for the cows maintained in these herds during the year.

Dairy structures used by these 17 dairies consisted of 17 milking barns, 15 milk houses, 1 granary, 3 feeding barns, 14 silos, and 5 sheds. Investment in these structures amounted to $33,215.17, averaging about $1950, but ranging from $340 to $5484. Five dairies were equipped with dairy structures involving an investment of less than $1000, five possessed dairy buildings worth from $1000 to $2000, four of from $2000 to $3000, and four in excess of $3000. Seven dairymen spent various sums for building upkeep, totaling $298.47, and ranging from $7.50 to $109.50. Sums so spent constituted 9/10 of 1 per cent of the amounts invested in such items. Depreciation amounted to $1329.65, or 4 per cent of the investment.

A total of 33¼ acres of land was utilized in corrals and dairy building sites on these seventeen dairies, ranging from ½ an acre to 5 acres, and having an annual use value of $617.50, or $18.30 per acre. Investment in minor improvements, such as fences, watering facilities and sewage disposal systems, totaled $6949.02, averaged $291.12 per dairy, and ranged from $125 to $1393 for the different dairies. Nothing was reported as having been spent for corral upkeep. Depreciation for the year amounted to $624.90, or practically 9 per cent of the investment in such improvements.

Dairying equipment used on these 17 dairies consisted of 6 milking machines, 12 separators, 7 milk coolers, 43 milk buckets, 107 milk cans, 9 milk carts, 6 gasoline engines, 2 feed trucks, 1 sterilizer, 8 wheelbarrows, 10 strainers, 4 veterinary outfits, 2 clippers, 3 scales, 12 lanterns, and a varied assortment of brooms, brushes, shovels, forks, hose, and similar minor items. Investment in dairy equipment totaled $4927.14, averaged $289.83, and ranged from $39.37 to $964. Fifteen dairymen made expenditures for the purpose of maintaining this equipment, the sums so spent totaling $268.65, although varying from 60 cents to $54.03 for the

different dairies. Upkeep therefore constituted 5.5 per cent of the investment. Depreciation amounted to $930.43, or 18 per cent of the amount of the investment in such items.

Calves credited to the dairy numbered 353, reported as worth $3627.70, or approximately $10 per head. Most dairymen valued any calves saved at $5 per head, this being the lowest valuation placed. The highest was $50 a head on 11 calves.

No actual sales of manure from the dairies were recorded, and of the 17 dairymen, two did not consider that the manure possessed any value. The other 15 gave the dairies credit to the extent of $1719, this being for 349 cows on these 15 dairies.

Fig. 9.—Typical dairy building layouts in the San Joaquin-Stanislaus district. The barn of Fig. 9 (Continued) is the two-cow unit method with milk-house attached.

Six of these 17 dairymen sold whole milk as such, nine sold butterfat, and two sold both whole milk and butterfat. Total production of these 17 dairies amounted to 2,798,145 pounds of whole milk, containing 112,699.2 pounds of butterfat. Of this total production, practically 93 per cent was sold, while the remaining 7 per cent was used at the dairy. Tests of the milk from the various herds averaged from 3.4 to 5.3 per cent butterfat, averaging for the total production 4.03 per cent.

The average annual production for the 417 cows studied in this district amounted to 6710 pounds of whole milk, or 270.3 pounds of butterfat. The lowest herd average of these 17 dairies was 5106 pounds of whole milk; the highest 8667. The lowest herd average of butterfat production per cow was 206.2 pounds; the highest 328. Of the 17 dairies, nine herd averages were below the district

Fig. 9.—(*Continued.*)

TABLE 12

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE SAN JOAQUIN–STANISLAUS DISTRICT

Dairy No.	Aver. of District	282	283	287	288	290	291	292	292a	190	192	193	194	196	197	198	199	200
No. of cows	417	31	20	19	14	15	20	34	38	33	64	13	25	12	18	14	13	34
Cost items:																		
Labor	$59.72	$60.83	$54.25	$69.42	$72.30	$72.25	$80.78	$55.67	$47.79	$50.06	$57.64	$67.28	$71.36	$70.21	$53.40	$53.94	$53.84	$56.90
Feed	79.63	70.55	84.22	82.09	102.31	103.29	105.39	85.48	27.29	91.91	71.24	86.11	112.62	85.49	84.14	74.93	104.68	66.62
Minor items	13.07	20.90	20.11	12.64	9.69	7.96	20.52	9.41	12.80	7.82	7.91	7.20	16.58	7.51	13.30	8.34	14.20	23.05
Herd charge	19.65	17.08	5.33	59.01	21.24	*43.51	60.63	34.64	*28.52	27.58	13.30	13.88	29.75	24.88	45.67	50.61	5.22	26.56
Building charge	9.88	4.90	14.89	7.31	25.24	22.93	7.05	8.02	14.52	17.87	6.88	13.73	6.98	3.70	2.77	9.42	12.46	2.91
Corral charge	3.98	2.75	8.80	2.44	5.01	4.44	11.38	3.62	4.85	2.59	1.45	2.89	2.66	3.46	5.26	6.88	3.28	3.59
Equipment charge	3.66	.47	6.21	1.85	2.26	3.61	3.01	5.82	8.29	2.02	3.50	1.55	1.54	2.85	.56	9.80	5.66	2.58
Total gross cost	$189.59	$177.48	$193.81	$234.76	$238.05	$214.48	$288.76	$202.66	$115.54	$199.85	$161.92	$192.64	$241.49	$198.10	$205.10	$213.92	$199.34	$182.21
Credits—Calf, manure, and herd	12.99	10.45	6.75	16.95	34.29	65.85	31.50	5.15	38.17	8.70	15.72	9.00	13.36	9.41	8.17	14.29	13.00	8.15
Net cost of whole milk	$176.60	$167.03	$187.06	$217.81	$203.76	$148.63	$257.26	$197.51	$77.37	$191.15	$146.20	$183.64	$228.13	$188.69	$196.93	$199.63	$186.34	$174.06
Production of whole milk, lbs.	6710	6352	5589	7623	6562	8534	8564	6164	5892	6497	5106	6504	7913	7319	7577	5923	7268	8667
Cost per cwt. of whole milk	$2.63	$2.63	$3.35	$2.86	$3.15	$1.74	$3.00	$3.20	$1.31	$2.94	$2.86	$2.82	$2.90	$2.58	$2.60	$3.37	$2.56	$2.02
Net cost of whole milk	$176.60	$167.03	$187.06	$217.81	$203.76	$148.63	$257.26	$197.51	$77.37	$191.15	$146.20	$183.64	$228.13	$188.69	$196.93	$199.63	$186.34	$174.06
Credit for available skimmilk	15.09	13.95	10.96	17.06	14.62	19.58	19.50	14.12	13.52	14.66	11.19	14.74	17.98	16.51	17.22	13.62	16.53	19.95
Net cost of butterfat	$161.51	$153.08	$176.10	$200.75	$189.14	$129.05	$237.76	$183.39	$63.85	$176.49	$135.01	$168.90	$210.15	$172.18	$179.71	$186.01	$169.81	$154.11
Production of butterfat, pounds	270.0	315.5	264.2	328.0	295.3	290.1	304.3	215.7	206.2	259.8	270.6	260.0	303.8	292.8	297.0	207.3	268.3	280.6
Cost per pound of butterfat, cents	60.0	49.0	67.0	61.0	64.0	44.0	78.0	85.0	31.0	68.0	50.0	65.0	69.0	59.0	60.5	90.0	63.0	55.0

*Credit.

average production of whole milk, and seven dairies were below the district average butterfat production.

Prices received by dairymen in this group depended upon the character of the product sold. Dairies confining their attention to sales of whole milk received sums which, averaged for the period that cost data were being collected, amounted to $2.23 per 100 pounds, or to 55¾ cents per pound of butterfat contained therein. During the year, sales of dairy products delivered as butterfat in cream brought average net prices of 46 cents per pound of butterfat to the dairymen who practiced no other method of selling.

Costs of production by Individual Dairies

Table 12 shows the cost of producing butterfat on each of the 17 dairies studied in San Joaquin and Stanislaus counties. The data are presented on a one-cow basis for ease in making comparisons.

Dairies numbered 190 to 200 inclusive are in San Joaquin County, those numbered 282 to 292A inclusive are in Stanislaus County.

The findings show that the cost of producing butterfat in this district ranged from a low of 31 cents to a high of 90 cents per pound of butterfat produced on the individual dairies. Of the 17 dairies, but six produced at a cost below the average of the group of dairies studied in this district, i.e., 60 cents a pound.

6. FRESNO DISTRICT

Brief Description of Area

Dairies selected in Fresno County for studying costs of production were located in the dairying section along the southern boundary of the county and included two dairies in Kings County, these two being found sufficiently similar to those selected in Fresno County to justify their inclusion in a common group. Seventeen dairies rounded out the year of record taking satisfactorily and were included in the final analyses. Of the 17, 7 were located near Riverdale, 4 in the vicinity of Laton, 3 at Burrell, and 1 each at Caruthers, Hanford, and Guernsey. All records were taken for the calendar year from January 1, 1922, to January 1, 1923. Dairying constituted the principal enterprise on the farms coming under this study.

In size, the different holdings varied from 35 to 312 acres with a general average of 107 acres. The major portion of the land was cropped, although some salt grass pasture was maintained. The cropped areas were under irrigation and were mostly utilized for alfalfa, fed as hay or pastured green, with minor areas of oats, barley, sorghum, some silage and similar crops. Outside of salt grass

pastures, all pasturing was furnished by crops grown specifically for the purpose on irrigated and cultivated fields. Every one of the 17 dairies reported alfalfa acreage.

In feeding the milking herd, pasture and alfalfa hay were chiefly used. Some dairymen used no concentrates and others who did were inclined to eliminate their use when the pastures were good or the cows not up to full production. A little barley hay, oat hay, and Sudan grass hay was fed. Sorghum was grown to some extent for pasture and for silage. Concentrates, when fed, were made up of barley, coconut meal, beet pulp, middlings, molasses, cottonseed meal, molasses screenings, alfalfa-molasses meal, alfalfa meal, corn meal, corn, and bran. Of the 17 dairies, three fed concentrates consistently throughout the year and six for various periods ranging from 3 to 9 months. Eleven used pasture the year round, one for 2 months, four for 8 to 10 months, leaving but a single dairyman who possessed no pasture. Five dairymen made use of silage, and two of green sorghum. The pastures were generally of two kinds, salt grass and Bermuda grass being utilized to some extent for dry stock, while irrigated fields were maintained for the milking cows. These irrigated pastures were mostly alfalfa, although within a few years after planting, foxtail and wild oats creep in, both furnishing good pasture while tender and green.

The total number of cows in the 17 herds averaged 767 for the year, ranging from two herds of 16 cows each to a herd of 103. The average was 45, with two herds of 23 and 29, five of from 31 to 36, three of 41 to 47, two of 62 and 66, and one each of 71 and 84. The total number of bulls averaged 20.

With the exception of two dairies the Holstein was the only breed reported. One of the two exceptions reported Holsteins and some Jerseys, the other consisted of Shorthorns. Three dairies were made up entirely of purebred Holsteins, one herd of the three being entirely registered. In addition to these three, ten additional herds were headed by registered bulls, nine of them Holsteins, the tenth failing to report the breed. Three of the 17 dairies possessed registered Holstein cows. This gave the dairies covered by the study a total of 16 registered bulls, 62 registered cows, and 16 purebred cows not registered. Hence 80 per cent of the total number of bulls were registered and 10 per cent of the total number of cows either registered or purebred.

Cows were bred to calf at any time throughout the year, feed and labor conditions making the maintaining of a full milking string both feasible and desirable.

Milking was commonly done at 12-hour intervals, usually at 3, 4, or 5 in the morning and again at the corresponding hour in the afternoon. One dairyman milked at 1:30; another at 2:30; while one man had his milking done at 7 A.M. and 6 P.M. Eight dairymen used milking machines and nine practiced hand milking.

Four nationalities were represented in this group of dairymen, there being twelve Americans, two Danish, a Swiss-American, a Swiss, and a Hollander. Nationalities of milkers employed on these dairies included Americans, Portuguese, Danish, Hollanders, Swiss, and Italians.

Sales of both whole milk and butterfat in cream were reported. During the year these 17 dairies made sales to the Riverdale Coöperative Creamery; Jersey Farm Dairy Company, Fresno; Portuguese Dairymen's Association at Hub; Hall's Dairy and Swift's Creamery at Hanford; Danish Creamery, Fresno; Central California Creameries Company; Kings County Creamers; Lucerne Creamery, Hanford; and the Los Angeles Creamery Company. By-products, when available, were utilized in the feeding of calves and hogs, nine of these dairies reporting such use of their skimmilk.

Sixteen of the 17 men included in this study owned the land they were operating, the other was a tenant farmer.

Summary of Costs

The summarized cost of producing whole milk and butterfat on the 17 dairies studied in Fresno County is set forth, with considerable detail in table 13, which follows.

TABLE 13

COST OF MILK PRODUCTION SUMMARY—FRESNO COUNTY

Number of dairies	17	
Number of cows	767	
Number of bulls	20	
Costs		
Operating		
Labor		
Man—manual, 97,030 hours	$29,977.20	
Man—management	7,995.02	
Horse, 11,922 hours	1,170.53	
Insurance	33.75	
Gross labor cost	$39,176.50	
Credits	1.65	
Net labor cost		$39,174.85
Feed		
Pasture	$5,680.95	
Hay, 2,988.3 tons	39,849.50	
Concentrates, 267.5 tons	8,924.51	
Silage, 573 tons	3,842.50	
Green sorghum, 442 tons	1,428.00	
Insurance	256.80	
Total feed costs		59,982.26
Hauling milk and cream		5,327.81
Supplies, cow testing, etc.		2,612.98
Interest on operating capital, $3,569 @ 6%		214.14
Herd charge		
Interest on average investment in cattle, $108,068.82 @ 6%	$6,484.13	
Depreciation	379.96	
Mortality: 37 cows, $4,110; 1 bull, $1,800	5,910.00	
Taxes	901.22	
Gross herd charge	$13,675.31	
Credits	300.00	
Net herd charge		13,375.31
Buildings charge		
Interest on average investment of $30,790.75 @ 6%	$1,847.44	
Depreciation	1,783.00	
Upkeep	536.70	
Taxes	212.45	
Insurance	121.37	
Total buildings charge		4,500.96
Corral charge		
Use of land, including taxes	$324.50	
Interest on investment in improvements, $6,563.12 @ 6%	393.78	
Depreciation of improvements	312.25	
Upkeep	155.00	
Total corral charge		1,185.53

Equipment charge		
Interest on average investment of $8,680.67 @ 6%	$520.84	
Depreciation	2,722.85	
Upkeep	590.70	
Taxes	33.36	
Total equipment charge		3,867.75
Total gross cost		130,241.59
Credits		
Calves, 618	$5,713.00	
Manure	2,683.00	
Total credits	$8,396.00	
Net cost of whole milk		$121,845.59
Total production of whole milk		5,209,994 pounds
Cost per hundredweight of whole milk		$2.34
Total production of butterfat		182,543.92 pounds
Cost per pound of butterfat in whole milk		66.7 cents
Total cost of butterfat in cream		
Cost of whole milk		$121,845.59
Credit for skimmilk, 47,408.31 hundredweight @ 25 cents per 100 pounds		11,852.08
Cost of butterfat in cream		$109,993.51
Cost per pound of butterfat in cream		60.2 cents
Average annual production per cow		6793 pounds of whole milk 237.8 pounds of butterfat

Comments on Cost Findings

The herds included in this study were assessed for $22,950. Dairy buildings were assessed as a part of the total building equipment, so that an estimate had to be made of the portion chargeable against the dairy. This proportion amounted on an average to approximately 50 per cent, ranging from 20 to 70 per cent for the individual dairies and amounting to an assessment of $5525. Dairy fixtures were assessed for a total of $880. The tax rate per $100 of assessed value ranged from $3.04 to $5.41, depending upon the location of the dairy.

All but three of the dairymen reported the payment of premiums for buildings insurance, one carried employer's liability insurance, and seven insured feed. Totals were $121.37 for building insurance, $33.75 for workmen's compensation, and $256.80 for feed.

The average cost of man labor spent in producing the dairy output on these 17 farms amounted to 30.9 cents an hour. All dairymen placed a value upon the amount of time spent in management, the total amounting to $7995.02, or over 26 per cent of the sum spent for manual labor.

Horse labor used in connection with the dairy varied in cost from 5.2 to 46.0 cents per hour, or an average of 9.8 cents. All dairymen reported the use of horses in carrying on the work of their dairies.

Neither automobiles nor trucks were used by these dairymen in handling their output.

During the year the average costs for feeds amounted to: Pasture $4.63 an acre or $8.03 per cow per year for those who pastured, hay $13.33 a ton, concentrates $34.11, silage $6.71, green sorghum $3.23.

A number of dairymen and one coöperative creamery held that no hauling charge was paid, but it certainly costs money to move milk and cream from the farm to the point of acceptance by a buyer. Either the dairyman pays this charge directly in cash, or else he pays it indirectly by a reduction made in quoting him prices and in making returns to him for his product. Using all available data, therefore, a figure was determined that apparently fairly represents this charge, and this figure was used whenever hauling details were lacking. This serves to place the findings of this district on a footing with the results for other sections, thus making the deductions comparable. The figure finally determined amounted to a hauling charge of 18 cents per hundredweight of whole milk or 1 cent per pound of butterfat sold as cream. This same charge was also added in getting at average prices paid, so that a proper balance has been maintained. In the event that the dairyman did his own hauling, no additional charge was made, since the cost was then covered under the totals shown for man and horse labor. As a matter of fact, though, practically no deliveries were made in this way, and the contract hauling charge covered about all the total production.

Miscellaneous expenses for supplies, fuel, cow testing, and other items ranged from $11.75 to $372.00, with an average of $154 per dairy. The total monthly need for operating capital amounted to $3569 for the 17 dairies.

The average value of the milking cows amounted to close to $145, the bulls to about $350. In range, cow values rose from an average of $75 for one herd to an average of $401.25 for the highest valued herd. Seven dairymen valued their herds at $100 per head or less, while three set values of $250, $350, and $401.25 per head respectively. The rest ranged between these two groups, from $120 to $182.50 per head. Bull values per head ranged from $55 to $1800. One dairyman bought a bull for $400 at the beginning of the year and reported a second inventory value of $5000 at the end of the year. If this great appreciation had been included in its entirety, the paper profits on the bull account would have been out of proportion, since much of the value in this bull lies in his future performances. During the year under observation, this bull was responsible for only one-fourth of the number of calves dropped during the twelve months covered by the study. It therefore seems fair to allow one-fourth of the increase in value as applying to the year's business. This method brought the average investment more in line with the actual facts. The investment in cows amounted to a little less than 93 per cent of the total invested in cows and bulls.

Ten of the 17 dairymen reported cow appreciation aggregating $5064.50 and two bull appreciation totaling $340 during the year. The remainder reported depreciation to the extent of $3946.46 for cows and $1838 for bulls. For the district, the net herd depreciation amounted to $379.96 or about $3/10$ of 1 per cent of the investment.

Thirty-seven cows died of the 767 average herd number, or nearly 5 per cent. The total value was placed at $4110, or $110.09 per cow. Dying cows were therefore equal in value to 76 per cent of the general herd average. Only one bull was reported as dying, his value being placed at $1800.

Buildings for the milking herd consisted of a milking barn and milkhouse for each dairy, with an extra milking barn on one of the ranches, and seven silos. The investment in dairy buildings varied from $141 to $4000, with an average investment of $1811. Ten dairies possessed less than the average value in buildings. Building depreciation totaled $1783 or 5.4 per cent of the investment.

Twelve dairymen spent money for upkeep of dairy buildings, ranging from $3 to $175, totaling $536.70, and averaging $31.57. This was 1.4 per cent of the building investment.

Land required for corrals and dairy building sites totaled 48.5 acres, having a rental value of $324.50, or $6.69 per acre. The investment in improvements amounted to $6563.12, or $386.01 average per dairy. Depreciation ran up to $312.25, or about 5 per cent of the average investment. Six dairymen spent money on upkeep of corrals and building sites, ranging from $5 to $80, and totaling $155, or slightly over 2 per cent of the investment.

These 17 dairies reported dairying equipment ranging from $21 to $1176 and totaling $8680.67 in value, the average for the 17 dairies being $510.62. The largest single item of equipment was due to investment in milking machines, of which there were eight, amounting to $4735 of the total, according to the average values of the two inventories. Other equipment reported consisted of 19 milk coolers, 16 sterilizers, 13 milk tanks, 17 separators, 8 wheelbarrows, 9 milk carts, 2 sleds, 1 manure carrier, 1 feed cart, 1 milk tester, 2 gasoline engines, 2 electric motors, 1 scales, 1 hay carrier, 2 spray pumps, 3 water heaters, 235 milk cans, 74 milk pails, and a miscellaneous assortment of strainers, hose, brooms, brushes, shovels, forks, lanterns, scrapers, stools, and bull staff.

Depreciation of this equipment amounted to $2722.85, or 41.4 per cent of the average investment. All dairymen found it necessary to expend funds on upkeep of dairy equipment in amounts ranging from $3.50 to $164.85, totaling $590.70, and averaging for these dairies $34.74 for the year. Upkeep amounted to almost 7 per cent of the investment in equipment.

Other than the sale of feed sacks to the extent of $83, a $1.65 return for outside labor, and $300 received for bull service, no miscellaneous returns creditable against the dairies were obtained. The credit for sacks was deducted from the cost of concentrates; the herd credit shows under "Herd Charge" in the summary table; the small item of labor credit likewise appears under the heading of "Labor" in the summary table.

The usual credits to be given the dairies for calves, manure, and skimmilk, included $2683 for manure, the output being claimed of value by all but one dairyman, although the rate of value varied by wide extremes from a low of 50 cents per ton to a high of $4. Six hundred eighteen calves were deemed to have a value ranging from $2 to $47, and amounting in all to $5713. Fourteen of the 17 dairymen figured the calves as being worth not to exceed $7 per head for all saved for vealing or weaning. Available skimmilk was variously estimated to be worth from 10 cents to 35 cents per 100 pounds, with a general average of 23 cents. Twelve of the 17 dairymen set the value of their skimmilk at from 20 to 30 cents per 100 pounds. Total available skimmilk from all milk produced amounted to 4,740,831 pounds, which at 25 cents per hundred pounds possessed a value of nearly $12,000.

Of the 17 dairies, 5 sold whole milk on a butterfat basis, 8 confined their attention to the sale of butterfat in cream, while the remaining 4 sold on a butterfat price basis both whole milk and butterfat in cream. Of the total sales 45 per cent went as whole milk, and 55 per cent as cream. Of total production, which includes milk used in the home or on the ranch, sales constituted 83.1 per cent.

The average records of production made by the 767 cows covered by this study amounted to 6793 pounds of whole milk per cow per year, testing from 3.2 to 3.9 per cent butterfat, and equivalent to 237.8 pounds of butterfat a year. The

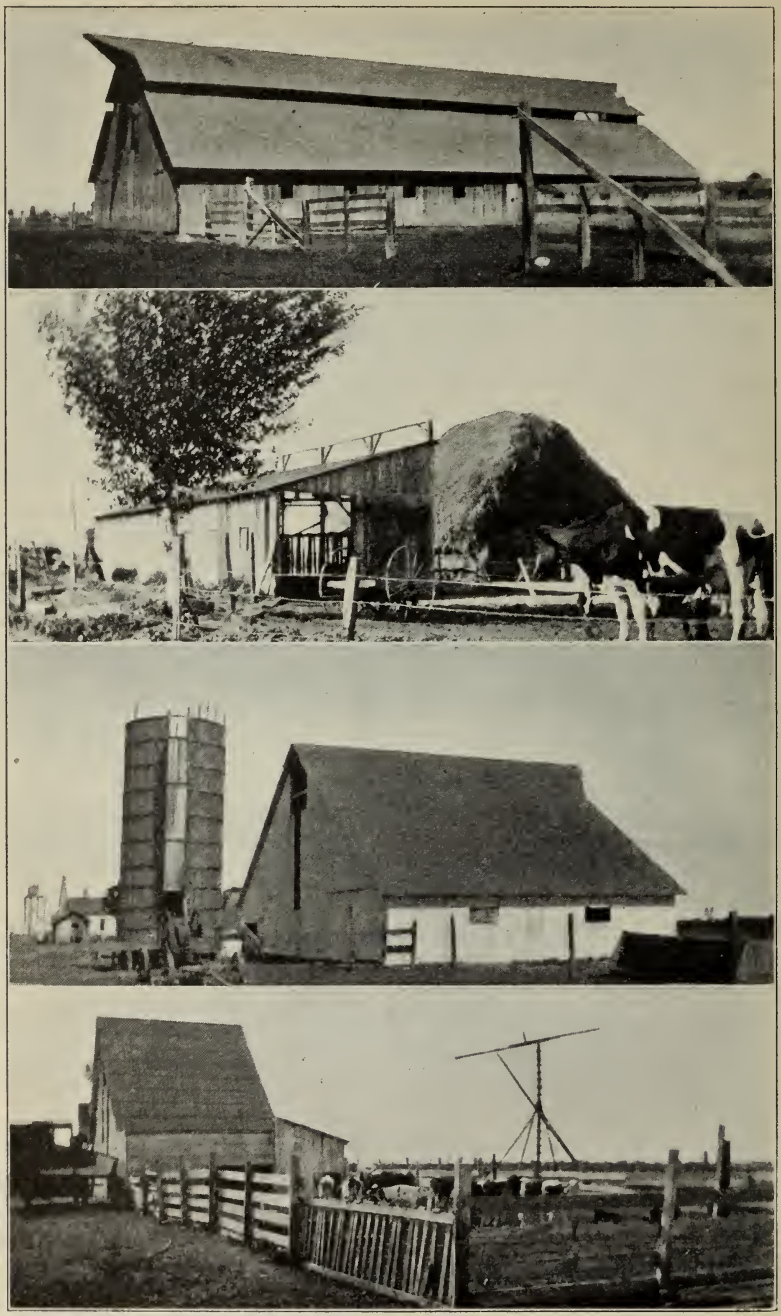

Fig. 10.—Various types of milking barns. Near Riverdale in the Fresno County section. (Photographs by L. R. Ward.)

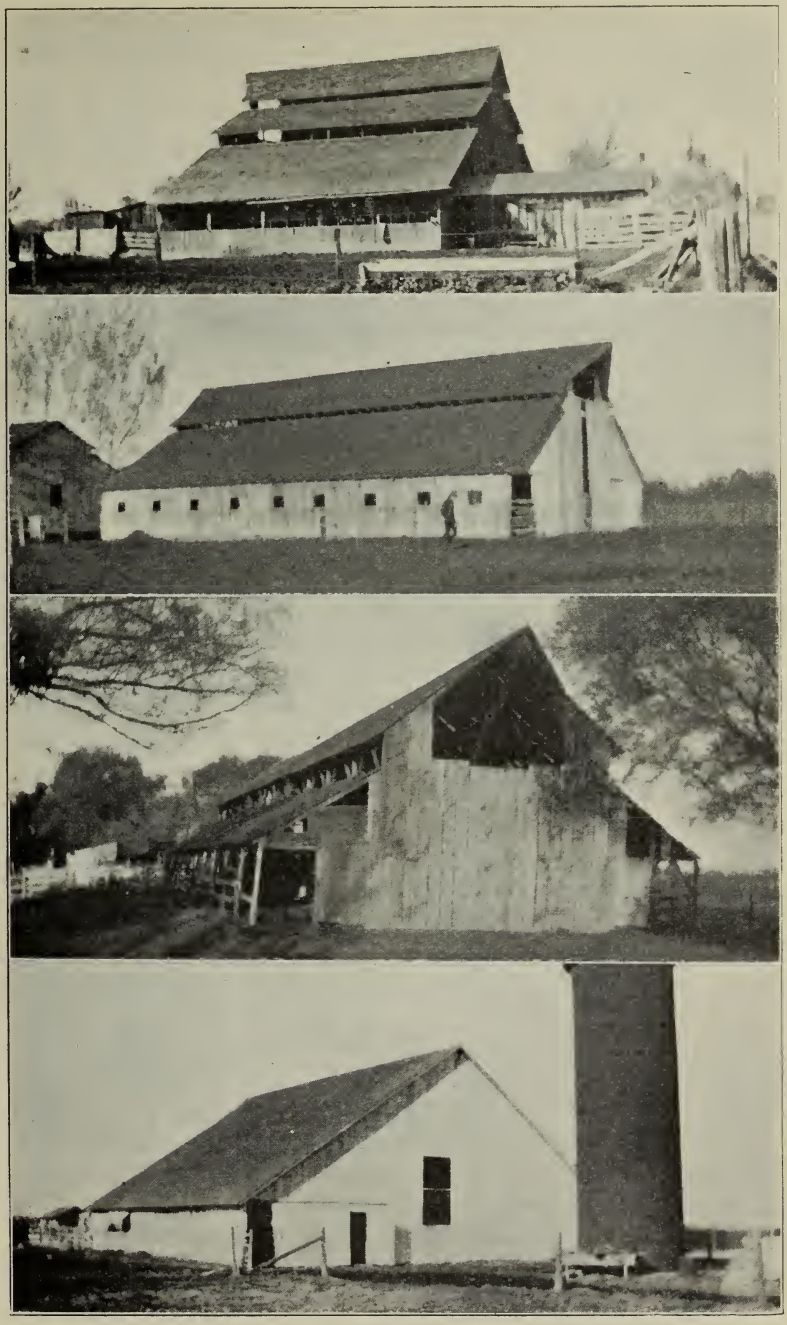

Fig. 10.—(*Continued.*)

TABLE 14—Average Cost and Production per Cow for Individual Dairies in the Fresno District

Dairy No.	Aver. of Dist.	26	27	29	30	34	35	36	37	38	39	41	42	44	46	47	78	79
No. of cows	767	62	47	84	31	103	16	42	23	35	67	16	29	71	31	36	33	41
Cost items:																		
Labor	$51.04	$39.59	$64.23	$50.94	$48.13	$35.07	$67.30	$49.36	$45.50	$56.75	$35.57	$95.02	$46.03	$45.65	$55.24	$48.43	$73.15	$90.96
Feed	78.15	110.26	59.01	22.46	115.82	30.35	99.06	143.22	43.76	62.17	45.20	144.39	80.23	40.63	105.45	109.80	186.20	170.17
Minor items	10.63	12.14	12.52	8.94	22.20	3.49	5.92	21.85	2.80	4.18	13.20	9.07	13.17	6.56	15.52	12.88	14.78	11.83
Herd charge	17.43	6.05	*2.16	20.44	10.17	7.64	*6.42	*24.55	*16.56	27.23	6.80	20.12	19.81	19.76	12.30	* .57	122.72	88.56
Buildings charge	5.86	5.14	8.49	3.91	4.49	.57	2.66	11.22	.52	2.66	4.50	4.46	11.30	2.62	9.61	2.20	13.18	22.64
Corral charge	1.55	1.15	1.28	.49	1.43	.12	2.75	1.82	1.41	.71	3.47	3.55	2.59	.86	1.61	.55	3.19	4.28
Equipment charge	5.04	15.34	6.91	3.13	6.59	2.99	2.10	5.21	1.32	2.35	1.90	8.57	3.95	2.61	10.01	1.41	6.03	7.89
Total gross cost	$169.70	$189.67	$152.44	$110.31	$208.83	$80.23	$179.79	$232.68	$95.31	$156.05	$110.64	$285.18	$177.08	$118.69	$209.74	$175.27	$419.25	$396.33
Credits—Calf, manure and herd	10.94	1.91	12.29	1.40	12.82	2.72	18.85	79.07	23.10	11.72	3.31	88.03	3.33	5.75	9.55	10.12	29.03	5.30
Net cost of whole milk	$158.76	$187.76	$140.15	$108.91	$196.01	$77.51	$160.94	$153.61	$72.21	$144.33	$107.33	$197.15	$173.75	$112.94	$200.19	$165.15	$390.22	$391.03
Production of whole milk, pounds	6793	5354	6257	6317	7311	5467	9104	8490	5261	6898	7364	6092	7441	6315	6526	6721	10693	8340
Cost per cwt. of whole milk	$2.34	$3.50	$2.24	$1.72	$2.68	$1.42	$1.77	$1.81	$1.37	$2.09	$1.46	$3.24	$2.33	$1.79	$3.07	$2.46	$3.65	$4.69
Net cost of whole milk	$158.76	$187.76	$140.15	$108.91	$196.01	$77.51	$160.94	$153.61	$72.21	$144.33	$107.33	$197.15	$173.75	$112.94	$200.19	$165.15	$390.22	$391.03
Credit for available skimmilk	15.44	13.33	14.15	14.27	17.88	12.29	20.47	19.14	11.80	15.57	16.55	13.89	16.65	14.16	14.59	15.12	24.23	18.72
Net cost of butterfat	$143.32	$174.43	$126.00	$94.64	$178.13	$65.22	$140.47	$134.47	$60.41	$128.76	$90.78	$183.26	$157.10	$98.78	$185.60	$150.03	$365.99	$372.31
Production of butterfat, pounds	237.8	177.5	209.4	216.1	274.3	191.3	316.8	290.0	184.1	240.0	266.8	212.6	267.8	221.0	239.3	240.9	372.1	297.1
Cost per pound of butterfat, cents	60.2	98.4	60.4	43.8	64.9	33.9	44.3	46.3	32.8	53.6	34.0	86.2	58.6	44.7	77.5	62.3	98.2	125.3

* Credit.

highest herd average ran 10,693 pounds of whole milk, or 372.1 pounds of butterfat. This was a herd of 33 cows. The lowest whole milk record made by any of these herds was an average of 5261 pounds, the lowest average butterfat production being 177.5 pounds. Scanned from the standpoint of butterfat production, three herds averaged less than 200 pounds of butterfat per cow per year, twelve from 209.4 to 297.1 pounds, and two over 300 pounds, these producing 316.8 and 372.1 pounds respectively.

Figured from actual sales of both whole milk and cream made by these 17 dairies, the gross receipts, that is with the hauling charge included, averaged for the year 62.5 cents per pound of butterfat sold in cream. A price of $2.27 per 100 pounds was received for a portion of the milk sold for retailing.

Costs of Production by Individual Dairies

In the following table are presented the data for each individual dairy, including the general average for the 17 dairies included in this study. Costs vary within rather wide limits as between dairies and also in contrast with the community average. These facts can be noted in the table which sets forth the findings on a basis of the average per cow.

The range of production costs were from a low of $1.37 a hundredweight of milk and 32.8 cents a pound of butterfat, to a high of $4.69 a hundred pounds of milk and $1.25 a pound of butterfat. The district average was $2.34 a hundred pounds of milk and 60.2 cents a pound of butterfat. Eight of the 17 dairymen produced at a cost lower than the district average.

With the exception of dairies numbered 78 and 79, which are in Kings County all are in Fresno County.

7. KERN DISTRICT

Brief Description of Area

Fifteen dairymen supplied data in sufficient and satisfactory detail to permit their inclusion in the final summing up of this district. All records ran from January 1, 1922, to January 1, 1923. The 15 dairies were selected as representative of the dairying industry in the county, two being located near McFarland, two at Wasco, while the remainder were contiguous to Bakersfield although situated within a radius of several miles to the south, southeast, and southwest of the town. Dairying constituted the major enterprise on these farms, farming activities being carried on primarily to furnish feed for the dairies.

In size, the holdings ranged from 32½ to 320 acres. Four of the holdings were 40 acres or under in size, 3 between 40 and 79 acres, 5 between 80 and 159 acres, and 3 between 160 and 320 acres. The

lands consisted mostly of level, irrigated lands, utilized for the growing of alfalfa with some grain, silage crops and Sudan grass. There was a small amount of pasture obtainable from salt grass, swamp, and wild grass, but generally the method tended toward the use of all available land for alfalfa and other farmed crops. Every dairy reported alfalfa acreage with all other crops supplementary.

In feeding the milking herd the greatest reliance was placed upon alfalfa as hay and as pasture. A little barley hay was used, and a limited amount of concentrates, the latter consisting of barley, middlings, mill feed, corn, beet pulp, cottonseed, and bran. Limited use was made of salt grass, wild grass, Sudan grass, and grain stubble, with fodder, silage, and pumpkins occasionally fed. Of the 15 dairies, 5 relied upon hay and pasture from alfalfa as their sole feeds, 3 upon alfalfa hay and pasture and corn silage, 2 added a limited amount of concentrates to their hay, pasture, and silage, 2 some concentrates to their hay and pasture, 3 utilized alfalfa for hay and pasture, supplemented with a small amount of concentrates and occasional amounts of fodder or pumpkins. Generally hay, silage, fodder, pumpkins, and concentrates were used when the pasture was short. During the summer months, May, June, July, and August, feeds supplementary to pasture were discontinued where such curtailment was practiced. Of the 15 dairies, however, 9 supplied supplementary feeds in addition to pasture for 11 or 12 months, 3 for 8 months, 2 for 6 or 7 months, 1 for 4 months. Pasturage is a year-round practice with 6 of these 15 dairymen, 6 others utilizing pasture for from 9 to 11 months, and 1 each for 2, 5, and 7 months respectively. Thus, all 15 dairymen secured pasture in addition to hay, concentrates and feeds other than pasture.

The 15 herds ranged in size from 10 to 77 head, and totaled 599 cows. Eight dairies possessed between 10 and 35 head, and 7 dairies from 47 to 77 head. The average for all the 15 dairies was 40 cows, and 1½ bulls.

The Holstein is apparently the favorite breed in this district, 9 dairies possessing only Holsteins, 2 mostly Holsteins, while 1 each possessed Guernsey or grade Jersey, with 2 reporting "mixed" cattle. There were 3 registered bulls found on the 15 dairies, all Holsteins, and 5 more eligible to registery, these 5 consisting of 2 Guernseys, 1 Jersey, and 2 Holsteins. Hence 8 out of a total of 23 bulls used on these dairies were purebred. One purebred cow, a Guernsey, was reported.

On these dairies, cows are bred to provide so far as possible an equal number of milking cows regularly throughout all months of

the year, hence calves were dropped during all months. In reality, though, a greater percentage of calves came during the cooler months, particularly during December, January, February, and March.

Milking was done at approximately 12-hour intervals, although considerable variation was found to exist in the hours selected for milking. The milking of most of the herds, however, started between the hours of 4 and 5, morning and afternoon. One dairyman began operations at 2 A.M. and 2 P.M., 1 between the hours of 3 and 4, 4 dairymen between 5 and 6, and 1 at 6 o'clock.

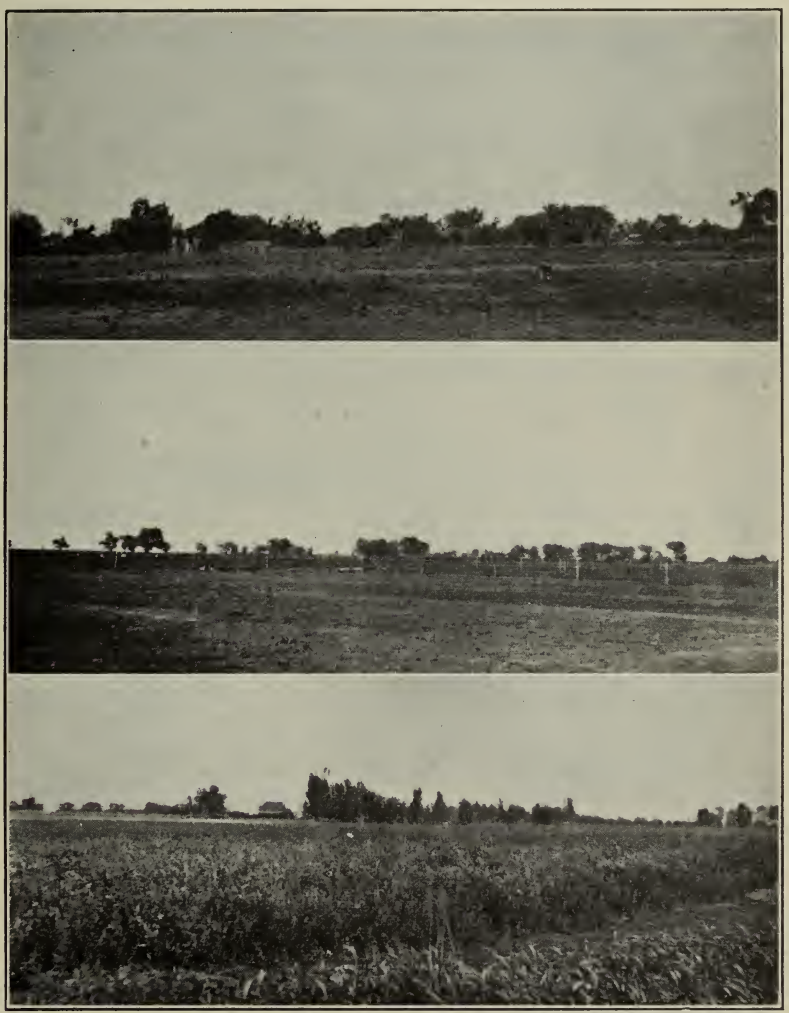

Fig. 11.—Typical dairying section of Kern County. The two upper photographs are of pastures consisting of wild oats, foxtail, Bermuda grass and alfalfa. Lower photograph is of alfalfa utilized green and as hay.

Five nationalities were represented in this group of dairies, there being 6 Americans, 5 Italians, 2 Swiss, a Canadian, and a Dane. Milkers were reported as being mostly Americans but with a sprinkling of Italian, Canadian, Swiss, and Spanish.

Both butterfat and whole milk were reported in the sales. Fourteen of the 15 dairies reported sales of butterfat, and of these five sold some of their product as whole milk. Only one dairy sold all its output as whole milk. During the year, sales were made to the Kern County Creamery and Farms Company, Meadowlark Creamery, Underwood Jersey Farm, Peacock and Goode, Kern County Sanitary Creamery, and to the Kern County Coöperative Dairymen. All but two of the dairymen used their available skimmilk as feed for calves, hogs, and poultry. Lack of sufficient stock necessitated throwing away a portion of this by-product.

Four of the dairymen were operating their places as tenants; the others owned the ranches that they were directing.

Summary of Costs

Table 15 sets forth the findings resulting from the assembling of the various cost items involved in the production of milk on the 15 dairies studied in Kern County.

TABLE 15

COST OF MILK PRODUCTION SUMMARY—KERN COUNTY

Number of dairies		15
Number of cows		599
Number of bulls		23
Costs		
Operating		
Labor		
Man—manual, 72,666 hours	$20,945.82	
Man—management	3,530.00	
Horse, 10,375 hours	1,046.92	
Liability insurance	59.00	
Total labor cost		$25,581.74
Feed		
Pasture	$13,875.00	
Hay, 1915 tons	25,108.85	
Concentrates, 69.19 tons	1,752.84	
Pumpkins, 13 tons	72.50	
Silage and fodder, 453 tons	2,843.00	
Total feed cost		43,652.19
Hauling milk and cream		5,002.09
Supplies, cow testing, etc.		2,490.35
Interest on operating capital, $3,223 @ 6%		193.56

Herd charge		
Interest on average investment in cattle, $62,339.50 @ 6%	$3,740.37	
Mortality: 32 cows; 0 bulls	2,990.00	
Taxes	505.90	
Gross herd charge	$7,236.27	
Credits and appreciation	7,246.95	
Net herd gain		*(10.68)
Buildings charge		
Interest on average investment of $22,960.50 @ 6%	$1,377.63	
Depreciation	541.60	
Upkeep	1,095.90	
Taxes	134.90	
Insurance	94.85	
Total buildings charge		3,244.88
Corral charge		
Use of land, including taxes	$527.00	
Interest on investment in improvements, $8,774.72 @ 6%	526.48	
Depreciation of improvements	367.20	
Upkeep	394.00	
Total corral charge		1,814.68
Equipment charge		
Interest on average investment of $5,698.58 @ 6%	$341.93	
Depreciation	1,100.24	
Upkeep	596.71	
Taxes	2.52	
Total equipment charge		2,041.40
Total gross cost		$84,020.89
Credits		
Calves, 422	$1,309.50	
Manure	2,614.00	
Herd appreciation	10.68	
Total credits	$3,934.18	
Net cost of whole milk		$80,086.71
Total production of whole milk		3,589,783 pounds or 417,417 gallons
Cost per hundredweight of whole milk		$2.23, or 19.2 cents per gallon
Total production of butterfat		140,444.2 pounds
Total cost of butterfat in cream		
Cost of whole milk		$80,086.71
Credit for skimmilk, 32,510.68 hundredweight @ 30 cents per 100 pounds		9,753.16
Cost of butterfat in cream		$70,333.55
Cost per pound of butterfat in cream		50.1 cents
Average annual production per cow		5993 pounds of whole milk 234.4 pounds of butterfat

* A credit.

Comments on Cost Findings

The cows and bulls belonging to the milking herd on these 15 dairies were assessed at $17,260 and the dairy fixtures at $85. The dairy buildings assessment for the dairies amounted to $4195, after estimating the proportion of the total building assessment to be charged against the dairy. The tax rate varied with the locality, from $2.58 to $5.28 per $100 of assessment.

Six of the 15 dairies reported building insurance and two carried employers' liability insurance. Total premiums paid were small, being $94.85 for building insurance, and $59 for workmen's compensation insurance.

On an average, the cost of manual labor spent upon these dairies amounted to 28.8 cents per hour. Three of the 15 operators felt the time spent on management details to be so small as to amount to practically nothing, and these men charged for their time at the going rate for manual labor only. The other 12 valued their management time at from 50 cents to $1 per hour, the total time thus amounting to $3530. From one-half to four hours a day per dairy was given as the range in amount of time spent in purely managerial work. The management charge proved to be almost 17 per cent of the manual labor charge.

The cost per horse hour on the different dairies ranged from 5 to 18.6 cents an hour, with a general average of 9.8 cents. Two dairies found the use of horse labor unnecessary and hence had no charge for this item. The other dairies used horses to the extent of 10,375 hours during the year.

Neither automobiles nor trucks figured in the carrying on of the dairy work in this district.

The pasturage cost averaged $925 per dairy for the year, all dairies reporting the use of pasture. The pasture charge averaged $23.16 a cow a year. All dairies fed hay, amounting on an average to 127 tons to the dairy a year, and costing on an average $13.11 a ton. The average cost of concentrates amounted to $25.33 with pumpkins $5.58 a ton, corn fodder $3 a ton, and silage $6.31 a ton. Concentrates, pumpkins, and corn fodder did not constitute very much of the feeding rations during the year under observation.

All dairies paid for contract hauling, although in some instances the charge was not segregated, being taken out of the cream check so that only net payments showed. In every instance in these calculations, though, the hauling charge was figured, due allowance then being made in the amount of the receipts.

Miscellaneous charges made up of power, fuel and supplies, amounted to $2490.35 for the district.

A total of $3223 for operating capital was reported, or an average of $215 to the dairy.

The average value of the cows ranged within rather close limits. Based on the average of the first and second inventories, the figures ranged from a low of $87.50 a head to a high of $110, with a general average of $98. Bull values to the head ranged from $62.50 to $241.50, with a general average of $153. Of the total herd investment, the cow values made up 95 per cent, the bulls the remaining 5 per cent. The dairy herds showed a marked appreciation for the district, 12 of the 15 dairies reporting appreciation of cows and 7 appreciation of bulls. This appreciation can be attributed to heavy culling and a large number of young cows or first calf heifers in the herds at the beginning of the year which appreciated in value.

Herd mortality was made up of 32 cows valued at $2990, or $93 a head, being thus only slightly under the average herd value as shown in a preceding paragraph.

Mortality constituted a little over 5 per cent of the herd average. No breeding bulls were reported as dying. Eleven different causes were stated as the cause of death when the cause was known, 6 cows dying of bloat, 6 in calving, 5 from blackleg, 2 of indigestion, and 1 each from a broken leg, tuberculosis, lump-jaw, udder trouble, mule kick, paralysis, and the swallowing of baling wire.

Dairy building equipment for the 15 dairies consisted of 13 milking barns, 15 milkhouses, 6 silos, and 3 bull shelter sheds. The average dairy building investment for these 15 dairies amounted to $1531, ranging from $58.50 to $6145. Seven of the 15 valued the dairy buildings at less than $500, 2 at from $500 to $1000, 2 at from $1000 to $2000, while 4 valued their dairy buildings in excess of $2000. Depreciation was estimated at 3⅓ per cent on barns and milk houses, 2 per cent on silos, and 8 per cent on bull shelters.

Twelve of the 15 dairies met expenditures for building upkeep during the year, ranging from $10.50 to $305.50. On the basis of the amount invested in buildings, upkeep amounted to 4.8 per cent of this investment.

Forty-six acres of land were utilized in corral and dairy building sites, ranging per dairy from ½ to 8 acres. The rental value amounted to $527 for the 15 dairies or at the rate of $11.45 per acre. Investment in improvements such as corral fences, water troughs, sheds, etc., ranged from $87.75 to $2653, with a total for all the dairies of $8774.72, or an average to the dairy of $583.98. The depreciation of these improvements amounted to from $7 to $56, a total of $367.20, and an average to the dairy of $24.49. Depreciation was 4.2 per cent of the investment. Seven dairymen made expenditures on corral and building site upkeep, totaling $394, and ranging from $5 to $111. Corral upkeep amounted to 4.5 per cent of the total investment in corrals and minor improvements.

The total investment in dairy equipment amounted to $5698.58, ranging from $108.70 on one dairy to $1369.65 on another. The general average amounted to $379.91 per dairy. The usual assortment of dairy equipment was reported. All dairies possessed separators, milk cans, milk pails, milk stools, and similar equipment. In total numbers, these 15 dairies were using 15 separators, 4 milking machines, 179 milk cans, 52 milk pails, 18 coolers, 7 milk tanks, 10 lanterns, 17 forks, 17 brooms, 15 shovels, 9 engines, 12 wheelbarrows, 6 sterilizers, 2 steam boilers, 1 spray pump, 2 scales, and 1 milk tester. Some additional equipment was reported such as stools, a table, strainer cloths, hoes, canvas, shackles, brushes, hose, washtubs, and feed truck.

Depreciation of dairy equipment amounted to $1100.24 for all the equipment possessed by these dairies, or approximately 20 per cent of the average investment. Fourteen of the 15 dairies found it necessary to make expenditures for dairy equipment unkeep, the total amounting to $596.71. The lowest expenditure was $7.25, the highest $111.50. Annual upkeep was 10½ per cent of the total investment in equipment.

The only returns to the dairies, other than the main sales and the miscellaneous credits for calves, manure, and skimmilk, were from bull service, two dairies reporting such, amounting to $12 in all.

Values per head for calves ultimately vealed or weaned but valued at the time of dropping ranged from $1.50 to $5 per head, or a total of $1309.50 for 422 head retained from 513 born. As the majority of the cows were Holsteins on the dairies included in this study, the range in calf values fell within rather narrow extremes, averaging $3.10 per head for the number kept.

All dairies reported some value for the manure produced by the dairies, the total amounting to $2614.

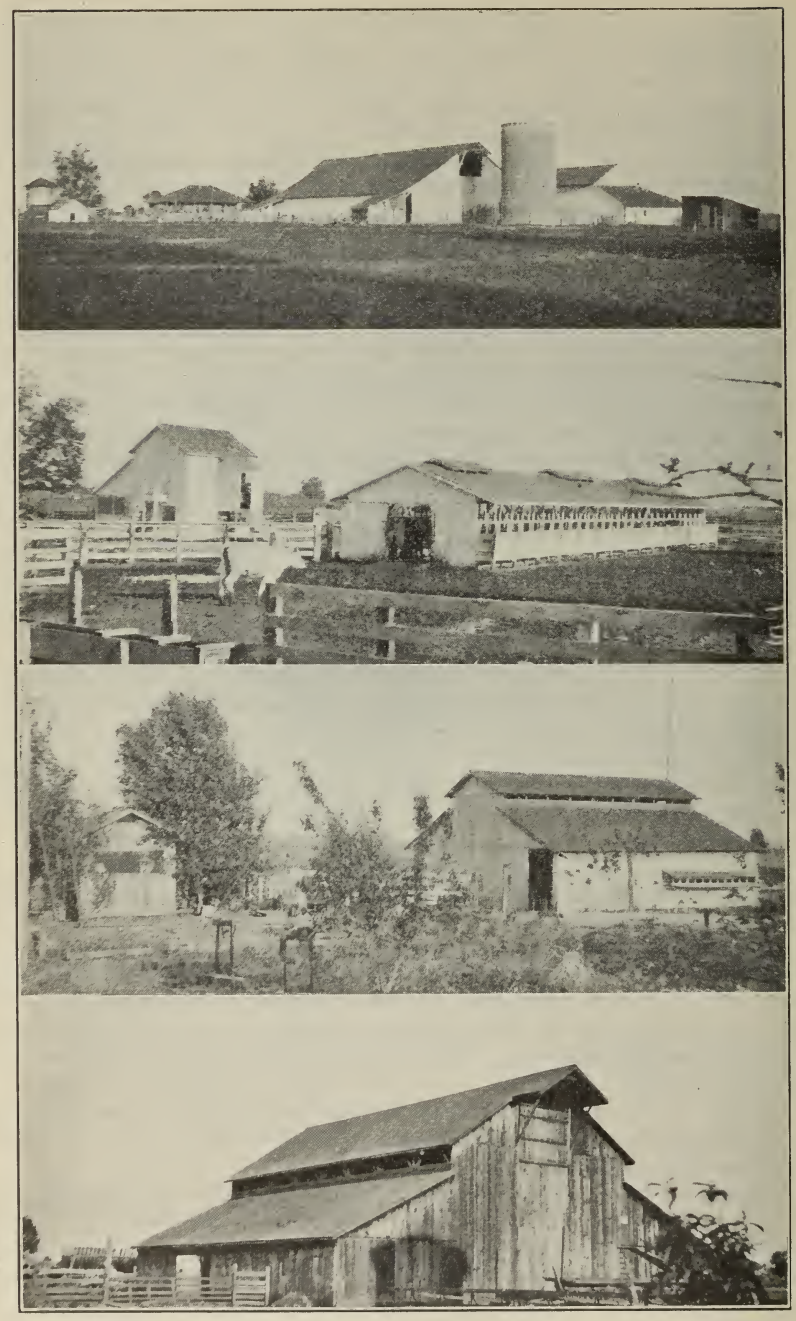

Fig. 12.—Representative Kern County dairy buildings.

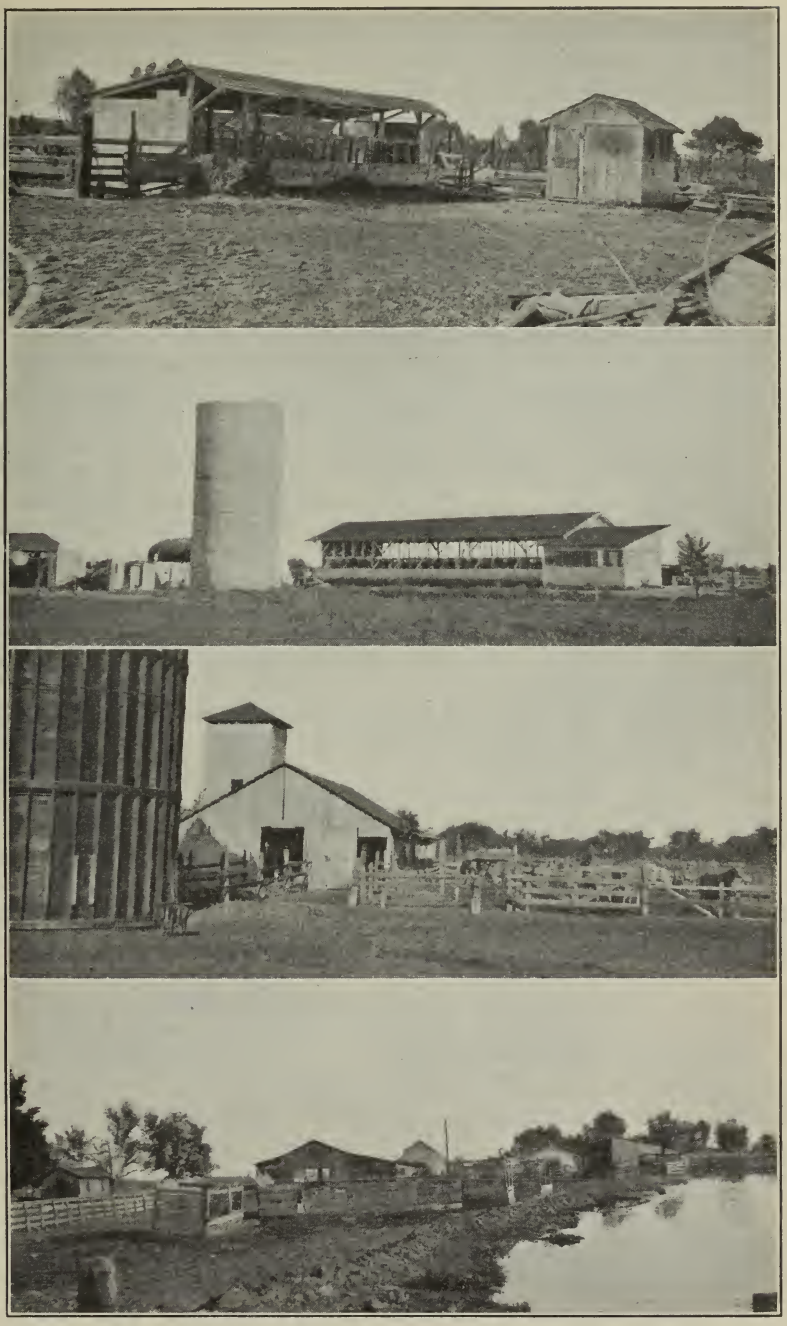

Fig. 12.—(*Continued.*)

One dairy only of the 15 sold whole milk exclusively, 5 sold both whole milk and butterfat, and 9 sold butterfat only. Calculated on a basis of whole milk, this meant a total production of 3,589,783 pounds, testing from 3.3 to 4.7 per cent butterfat, or an average of 3.9 per cent. This milk contained a total of 140,444.2 pounds of butterfat. Of the total production, practically 6 per cent was used on the ranch, the remaining 94 per cent being sold either as whole milk or as butterfat. Of the total sales, 27.4 per cent went as whole milk, the balance as butterfat in 40 per cent cream.

Estimates of the value of the skimmilk resulting from separating ran from nothing to 58 cents per hundred pounds. The average amounted to 30 cents, and this figure was used in the calculations. The value of skimmilk actually fed amounted to $5350.47. If all milk had been sold as cream, the resulting skimmilk would have possessed a value of $9,753.16.

The average annual production per cow for the 599 cows covered by this study amounted to 5993 pounds of whole milk, containing 234.4 pounds of butterfat. Seven dairies were below the average based on whole milk production, and seven below that based on butterfat production. The lowest whole milk average for a single herd was down to 4257 pounds of milk per cow per year; the highest amounted to 7397 pounds. The lowest herd average for butterfat production was 145 pounds per cow per year; the highest 324 pounds. For the 8 dairies having from 10 to 35 cows, the average production per cow of whole milk and butterfat was 6011 pounds and 225.9 pounds respectively as against averages of 5985 pounds of whole milk and 238.3 pounds of butterfat for the dairies having from 47 to 77 cows inclusive. The small size dairy group contained 187 of the total 599 cows. For all practical purposes, therefore, no radical difference occurred within this group division.

Actual sales of whole milk made by 7 of the 15 dairies brought in an average gross price of 22½ cents per gallon, or $2.61 per hundred pounds. Actual sales of butterfat commanded gross returns of 50.5 cents per pound. By "gross" returns is meant the amount of the check plus hauling charge of 2 cents per gallon of whole milk, or 2 cents per pound of butterfat. The hauling charge was included in order to make these selling prices comparable with the cost figure set forth in the summary table above, which includes hauling. Approximately one-third the receipts came from the sale of whole milk and the remaining two-thirds from sales of butterfat either in cream or in whole milk.

Costs of Production by Individual Dairies

Considerable variation exists in the costs of the different items entering into the production of whole milk and butterfat. For purposes of illustrating this point and also to permit the making of comparisons between dairies, as well as with the district findings as a whole, there appears in table 16 data in condensed form setting forth, on a basis per cow, the amounts of the various factors entering into the community averages as given above. From a district average cost of $2.23 a hundredweight of whole milk, the costs for the individual dairies ranged to a low of $1.37 and a high of $4.35. The range for butterfat was from 29.7 cents to $1.07, with an average of 50.1 cents. Seven dairies produced at a figure lower than the district average.

TABLE 16

Average Cost and Production per Cow for Individual Dairies in the Kern District

Dairy No.	Aver. of District	56	57	58	59	60	61	62	63	65	66	67	71	72	75	76
No. of cows	599	62	77	18	57	35	10	12	47	34	32	23	60	23	56	53
Cost items:																
Labor	$42.71	$40.21	$39.92	$46.31	$36.20	$42.50	$111.93	$24.13	$44.67	$45.40	$29.55	$48.55	$54.88	$32.67	$43.92	$39.90
Feed	72.87	53.20	66.13	110.81	61.54	140.12	72.80	67.58	53.53	132.64	53.94	52.00	90.61	58.71	62.91	57.94
Minor items	12.83	11.03	11.10	18.37	11.46	17.03	12.59	7.96	10.31	22.46	4.10	6.02	9.76	4.81	24.87	14.28
Herd charge	* .02	*20.18	3.39	19.30	8.37	.46	10.26	28.09	14.06	*44.20	8.74	*4.53	*16.63	.32	5.04	20.26
Building charge	5.42	.86	10.93	1.90	.99	2.21	11.11	1.99	4.43	19.08	.41	1.40	4.81	.45	8.43	6.68
Corral charge	3.03	.83	1.57	5.28	1.55	4.20	3.18	3.81	2.42	4.29	3.49	15.81	3.85	4.01	2.31	.19
Equipment charge	3.41	2.35	2.26	1.79	2.17	4.18	5.15	2.39	3.34	9.08	2.19	3.27	1.83	1.35	7.92	2.77
Total gross cost	$140.27	$108.48	$135.30	$203.76	$122.28	$210.70	$227.02	$135.95	$132.76	$232.95	$102.42	$126.95	$165.74	$101.78	$155.40	$142.02
Credits—Calf, manure and herd	6.57	23.24	7.59	4.58	4.60	7.75	12.30	5.84	7.61	52.65	6.72	11.05	21.56	18.15	8.77	2.26
Net cost of whole milk	$133.70	$85.24	$127.71	$199.18	$117.68	$202.95	$214.72	$130.11	$125.15	$180.30	$95.70	$115.90	$144.18	$83.63	$146.63	$139.76
Production of whole milk, pounds	5993	4601	5909	7397	5453	6716	4941	4958	4788	6458	4257	6571	7207	6087	6884	7006
Cost per hundredweight of whole milk	$2.23	$1.85	$2.16	$2.69	$2.16	$3.02	$4.35	$2.63	$2.62	$2.79	$2.25	$1.76	$2.00	$1.37	$2.13	$1.99
Net cost of whole milk	$133.70	$85.24	$127.71	$199.18	$117.68	$202.95	$214.72	$130.11	$125.15	$180.30	$95.70	$115.90	$144.18	$83.63	$146.63	$139.76
Credit for available skimmilk	16.28	12.73	15.75	20.15	15.15	18.32	13.43	13.42	12.86	17.57	11.73	17.94	19.66	16.72	18.34	19.26
Net cost of butterfat	$117.42	$72.51	$111.96	$179.03	$102.53	$184.63	$201.29	$116.69	$112.29	$162.73	$83.97	$97.96	$124.52	$66.91	$128.29	$120.50
Production of butterfat, pounds	234.4	151.8	265.9	295.9	201.8	248.5	187.7	198.3	205.9	251.8	144.8	243.1	266.7	225.2	323.7	245.3
Cost per pound of butterfat, cents	50.1	47.7	42.0	60.5	50.8	74.2	107.2	58.7	54.5	64.6	58.0	40.3	46.7	29.7	39.7	49.1

*Credit.

8. LOS ANGELES–ORANGE DISTRICT

Brief Description of Area

The year of study in the Los Angeles-Orange section rounded out with complete and satisfactory data from 40 dairies. The various dairies were selected from a rather wide extent of country, 21 being located in Los Angeles County, 14 in Orange County, and 5 in San Bernardino County. The 5 in San Bernardino County are similar in conditions to the dairies studied in Los Angeles County so these 5 are run in with the latter district and classified as Los Angeles records: Being situated 3 at Ontario and 2 at Chino, they were just over the county line. The Los Angeles dairies selected for study were situated 5 at Artesia, 4 each at Burbank and Van Nuys, 1 each at Norwalk, Whittier, and Lankershim, 1 in the city of Pasadena, and 4 in the city of Pomona. The Orange County dairies comprised 9 in the vicinity of Santa Ana, 2 at Buena Park, and 1 each at Anaheim, Garden Grove, and North Batavia.

The yearly records covered mostly from January, 1922, to January, 1923, these dates holding for all the Orange County records and for 14 from Los Angeles County. Seven of the remaining records dated from March 1, 1922, to March 1, 1923, and 5 from April 1, 1922, to April 1, 1923.

Dairying is followed often in conjunction with other farm enterprises. There is no specialized dairying section, dairies being scattered here and there throughout the farming belts, although usually on the lands better suited to field crop production, dairying gives way to fruit, truck, or similar intensive types of farming wherever conditions favor such practice.

These 40 dairies utilized 2160 acres of land. Seven of the dairies possessed corral and dairy buildings space only, so far as their dairies were concerned, these ranging from 1 to 5 acres per dairy and totaling 19 acres. Of the remaining 2141 acres, approximately 1000 acres was utilized by a single dairy, the survey including one large herd. This leaves 32 dairies with total area of 1141 acres, or an average of less than 40 acres each. These 32 by groups possessed acreages as follows: 6 of 10 acres or less, 3 of from 11 to 20 acres, 15 of from 20 to 40 acres, and 8 of from 40 to 102 acres. Three of the 5 dairies located within the city limits of Pomona and Pasadena had acreages of 10 acres each, 1 possessed 35 acres, while the fifth utilized corral space only.

Considerable of the total acreage was utilized by corrals. The remainder was used for alfalfa, corn, grain, and similar feeds, with some pasture on alkali, rolling, and swamp land and on alfalfa land between cuttings. The lands are far short of producing all the feeds needed by the dairies, and of necessity recourse is had to the purchase of additional feeds in large quantities. The cropped land is mostly level, under irrigation, and farmed to produce as much feed as possible. Pasturing of cattle is the exception rather than the rule. Only 9 dairymen reported pasture. Of the nine only 2 obtained year-round pasture; with the others pasturing was irregular and limited in

Fig. 13.—Typical dairy herd of the Los Angeles-Orange district.

amount. Heavy feeding under corral conditions is the general practice and cows are forced to maximum production, otherwise dairying is not profitable enough to justify its continuance.

Heavy feeding is the rule. For roughage alfalfa hay is the outstanding feed with a little additional use of oat and barley hays. Hay is fed the year round, supplemented with regular and constant use of concentrates. Considerable silage is utilized, and miscellaneous feeds such as crops cut green, bean straw, beets, and pumpkins.

Of the total herd numbers, 2242 cows and 64 bulls, 393 cows and 18 bulls were in the records for Orange County, and the remainder, 1849 cows and 46 bulls, in Los Angeles County and the contiguous section of San Bernardino County which was studied as a part of the Los Angeles dairying section. The average size of herd for the dis-

trict was 56, but of the 40 herds, 22 averaged less than 40 head, and of these, 16 had less than 30 head. Only 2 herds were over 100 head in size, these containing respectively 131 and 555 head. Four herds contained 40 to 50, four 50 to 60, four 60 to 70, two 70 to 80, and two 80 to 90 head each. Of the total number of herds, 14 were in Orange County and 26 in Los Angeles County (including the neighboring strip of San Bernardino County). The herds selected for study in Orange County ran from 11 to 57 in size, and totaled 392 cows and 18 bulls.

Of the 40 herds covered by the investigations in this part of the State, 1 was of registered Holsteins, 20 of Holsteins, 3 of mostly Holsteins; 3 of Jerseys; 7 of Holstein and Jersey; 1 of Holstein and Shorthorn; 1 of Jersey, Holstein and Shorthorn; 3 "mixed"; and 1 of Guernseys and Holsteins.

Twenty-six of the 40 herds reported registered bulls, 42 in number, and made up 33 Holsteins, 5 Jerseys, and 4 breed not given. This is 65.5 per cent of the total bulls reported for the district. Eighteen dairies reported registered cows to the extent of 128, consisting of 116 Holsteins, 3 Jerseys, and 9 breed not stated. This amounts to 5.4 per cent of the total average number of cows carried by the dairies during the year. Purebred stock, not registered, was not specially listed, but would add to the numbers given here. Cows are bred to freshen at all times of the year in order to keep up a regular production month by month. Only six dairymen reported that they attempted to have most of their cows freshen in the fall.

When dairying labor is hired, such employing comes in competition with the demands of other industries. Working hours, length of work day, and wages are therefore regulated somewhat in accord with those prevailing throughout the section in general. One dairyman milks at midnight and at 2 P.M.; 7 at 2 or 2:30; 12 at 3 or 3:30; 15 at 4 or 4:30; 3 at 5; and 1 at 6. On one dairy all the cows are milked three times a day, at 2:30 and 10 A.M., and 6 P.M. On a second dairy a part of the cows are milked three times daily, at 2 and 10 A.M. and at 6 P.M.

For dairy help recourse is had to various nationalities, the list for 1922 including mostly Americans but also Portuguese, French, Hollanders, Canadians, English, German, Swiss, Italians and Irish. Among the operators themselves, farm-owning American predominated, 36 of the 40 operators reporting as Americans; the other 4 claiming Canada, Holland, or Italy as their home countries.

Whole milk is the objective of these dairymen, the price received being determined by the butterfat content. Sales are considered in terms of hundredweight, with the price paid quoted as so much per pound of butterfat content of the milk. Thus if the price is 90 cents or $1.00 it means that these amounts are being paid for each pound of butterfat in milk of standard grade. If the price, then, is $1.00 per pound butterfat, a dairyman shipping milk testing 3.7 per cent butterfat would receive $3.70 per hundredweight. In this section of the state dairymen think in terms of butterfat, though selling whole milk, and in discussing prices it is the common practice to state returns as "so much per pound butterfat" instead of per gallon or per hundredweight. Milk failing to qualify under a stated grade is paid for only at the prevailing butterfat price in cream. This averages less than the price paid for whole milk, and milk so sold brings in no more than the value of the actual butterfat it contains.

During the year sales were reported as being made to the Los Angeles Creamery; the California Milk Producers' Association; Burr Creamery Company, Los Angeles; Excelsior Dairy, Santa Ana; Sanitary Dairy, Santa Ana; Crescent Creamery, Los Angeles; City Dairy, Pomona; Mutual Dairy Association; Little Rock Dairy, Los Angeles; Hansen Dairy, Los Angeles; Glendale Creamery Company; Sanitary Gold Seal Dairy, Los Angeles; Santa Monica Dairy Company; Ontario and Upland Creamery; Pomona Valley Creamery; and the Whittier Sanitary Dairy. Three of the 40 dairymen retailed their output, and 1 practiced a combination of retailing and wholesaling.

Of the 40 operators only 2 were tenant farmers, 1 was both owner and tenant, while the remainder were owners.

Summary of Costs

Table 17 sets forth the findings resulting from the assembling of the various cost items involved in the production of milk on the 40 dairies studied in Los Angeles and Orange counties.

TABLE 17

COST OF MILK PRODUCTION SUMMARY—LOS ANGELES AND ORANGE COUNTIES

Number of dairies		40
Number of cows		2242
Number of bulls		64
Costs		
Operating		
Labor		
Man—manual, 336,864 hours	$122,450.13	
Man—management	18,394.34	
Horse, 53,641 hours	5,782.40	
Truck and automobile, 18,732 miles	915.47	
Insurance	1,175.00	
Total labor cost		$148,717.34
Feed		
Pasture	$5,999.00	
Hay, 8,592.1 tons	188,785.20	
Concentrates, 2,833.18 tons	102,444.15	
Green feed, 6,109.75 tons	39,020.00	
Silage, 6,249.98 tons	47,188.40	
Pumpkins and squash, 2,427 tons	13,322.30	
Bean straw, 278.5 tons	3,629.00	
Insurance	687.49	
Total feed costs		$401,075.54
Hauling milk		30,306.13
Supplies, cow testing, etc.		16,604.46
Interest on operating capital $51,310 @ 6%		3,078.60
Herd charge		
Interest on average investment in cattle, $390,432.31 @ 6%	$23,425.94	
Depreciation	40,496.36	
Mortality: 75 cows, $11,384; 2 bulls, $165	11,549.00	
Taxes	4,085.93	
Insurance	563.76	
Gross herd charge	80,120.99	
Credits	166.00	
Net herd charge		79,954.99
Buildings charge		
Interest on average investment of $108,455.25 @ 6%	6,507.32	
Depreciation	6,122.41	
Upkeep	1,653.88	
Taxes	1,161.31	
Insurance	737.22	
Total buildings charge		16,182.14

Corral charge		
Use of land, including taxes, 117¼ acres	$3,985.00	
Interest on investment in improvements, $18,687.94 @ 6%	1,121.27	
Depreciation of improvements	2,135.76	
Upkeep	609.55	
Total corral charge		7,851.58
Equipment charge		
Interest on average investment of $12,666.93 @ 6%	760.01	
Depreciation	2,688.94	
Upkeep	1,906.09	
Taxes	69.37	
Total equipment charge		5,424.41
Total gross cost		$709,195.19
Credits		
Calves, 1527	$8,368.62	
Manure	28,928.88	
Total credits	$37,297.50	
Net cost of whole milk		$671,897.69
Total production of whole milk		18,019,576 pounds
Cost per hundredweight of whole milk		$3.73
Total production of butterfat in whole milk		692,993.1 pounds
Cost per pound of butterfat in whole milk		97 cents
Average annual production per cow		8041 pounds of whole milk 309.2 pounds of butterfat

Comments on Cost Findings

In commenting upon the findings in Los Angeles and Orange counties subtotals of some of the items for each of the two counties have been inserted in the following paragraphs because of local interest in the figures for the individual counties.

Orange County herds covered by this study were assessed at $14,955 and Los Angeles County herds at $85,815. Buildings belonging to the dairies were assessed at $4033 in Orange, and $24,950 in Los Angeles counties. Dairy equipment assessments amounted to $1772 in Los Angeles County, with no assessments in Orange County. The tax rate per $100 of assessed value ranged from $3.15 to $6.45 in Orange County and from $2.88 to $5.08 in Los Angeles County.

Thirty-two dairymen carried building insurance amounting to $85.73 worth of premiums in Orange County and $651.49 in Los Angeles County. Insurance of livestock was carried by but one dairy—in Los Angeles County, employers' liability insurance by 13 dairymen, and feed insurance by 15. Orange County liability insurance amounted to $173.08 and feed to $12. Los Angeles County totals amounted to $1001.92 for employers' liability and $675.49 on feed.

The cost of manual labor utilized in producing the output of these dairies averaged 36.4 cents per hour in this district. Of the total hours and money spent for manual work, 72,864 hours and $25,095.90 are chargeable against Orange County dairies and the balance against those of Los Angeles County. Of the total management charge, $2916.35 was reported from Orange County. Twenty-nine

dairymen of the district placed a figure upon the time spent by them in purely management work, the total amounting to 15 per cent of the manual labor charge.

Use of horses entered into the costs on 28 of the 40 dairies and were utilized to the extent of 12,750 hours in Orange and 40,891 hours in Los Angeles County. Costs amounted to $1673.42 in Orange and $4108.98 in Los Angeles County. The rate per hour throughout the district varied from 3.5 to 49.3 cents per hour for all work done by work horses. One saddle horse, kept solely for the dairy and used but a few minutes per day, cost the keeper $120 a year, or at the rate of $1.34 per hour, obviously an uneconomical proposition. The average cost per hour for all horse labor amounted to 10 cents.

Nine dairymen utilized trucks or automobiles in carrying on the work of the dairies. Of the 18,732 miles traveled in such work 1947 were by Orange County dairies at a cost of $222.46. The average cost per mile for the use of this equipment was 4.8 cents per mile. The range in costs varied from 3.6 to 13.9 cents a mile. The low average cost for the district is traceable to the fact that 87 per cent of the total hauling was done by a single dairy, with a second-hand truck operated at a mileage cost of but 3.6 cents. Of the remaining eight dairies the cost was respectively 6, 8, 10, 10, 10, 12.3, 13.9, and 11.9 cents per mile.

Of the 40 dairymen reported in this study, only 14 reported pasture and this of small value, all fed hay and concentrates, 27 fed silage, 6 fed pumpkins, squash, beets, wet beet pulp, and orange pulp, and 6 fed bean straw. All but 2 of the dairymen fed hay continuously throughout the year, alfalfa predominating with some use of barley and oat hay. Those not so feeding skipped only a month or two, and then commonly substituted green alfalfa. Feeding of concentrates was consistently practiced on all dairies throughout the year. A variety of concentrates was used. For instance, of 32 dairies where the feed was reported in detail, the numbers of kinds of concentrates fed ranged from 3 to 8, or an average of 5. The choice of dairymen in kinds of concentrates can be gathered from the analysis of the feeds used by 32 of these 40 dairymen. Twenty-eight fed barley, 26 sugar beet pulp, 22 bran, 20 coconut meal, 17 mill feeds of various kinds, 12 cottonseed meal, 11 corn, or corn meal, 5 oats, 2 alfalfa meal, 2 "blow-overs," and 1 each wheat, linseed oil meal, grape stems, middlings, and molasses. Silage was mostly fed during the months of October to March inclusive, with the bulk of the feeding taking place during November, December, January and February. Six dairymen fed silage all year, two for 10 months, and one for 11 months. Various use was made of green feeds from growing barley, corn, oats, and alfalfa, cauliflower leaves, pumpkins, squash, beets, beet tops, oat and bean straws, and of green beet pulp. Costs of feeds per ton during the year covered by this study averaged: Hay $21.97, concentrates $36.48, green feed $6.39, silage $7.55, pumpkins and squash $5.49, bean straw $13.03. Pasture per cow per year amounted to $2.68. The cost of hauling milk was made up of $7952.03 from Orange County and $22,354.10 from Los Angeles County. Expenditures for supplies, cow testing, and similar miscellaneous items amounted to $3557.92 on the Orange County dairies and $12,936.54 on those of Los Angeles County.

Orange County dairymen reporting for this study gave a total operating capital of $5835, while those of Los Angeles County reported a total of $45,475. Interest at 6 per cent thus amounted to $350.10 for Orange and $2728.50 for Los Angeles counties.

Dairy cattle values ranged about the same in all parts of the district, cows averaging $166.24, but ranging from $100 to $400 for herd averages. Seven dairy-

men figured their average cow values at $200 or more a head. Bull values per head covered a wide range, from $30 to $1000, but averaged $275. The total investment in herds amounted to $390,432.31, of which cow values contributed slightly over 95 per cent. Orange County herd investments made up $81,951.53 of this.

Of the 40 herds reporting data for this study depreciation of cows occurred with all but 9, these 9 showing an actual appreciation. Net depreciation of cows for the district amounted to $36,633.56. Of this $11,747.50 came from the Orange County dairies. Four dairies reported bull appreciation, 15 reported no change, while the remainder showed depreciation. The total net depreciation of bulls in the district amounted to $3,862.80, to which Orange County contributed $820.00.

During the year under observation 75 cows died, this number amounting to close to 3 per cent of the average number maintained in the herds. The value of those dying amounted to $11,384. Two bulls were reported as dying, these having a value of $165 each. Of the total, Orange County dairies suffered the loss of 16 cows valued at $2840 and 1 bull valued at $100.

The dairy buildings consisted of 40 milking barns, 32 separate milk houses, 32 feed, hay or shelter barns, 47 silos, 4 cow sheds, and 1 engine house maintained solely for the dairy on the ranch where it was found. The investment in dairy buildings ranged from $92.50 to $23,020. Fifteen dairies had a building investment of $1000 or less, 9 of from $1000 to $2000, 11 between $2000 and $5000, and 5 in excess of $5000. Of the total, Orange County dairy buildings made up $23,499.17. Thirty dairymen spent money for building upkeep, ranging from $3 to $587.50 during the year, totaling $1653.88, of which $200 was incurred for Orange County dairies. For the district, building upkeep amounted to 1.5 per cent of the building investment. Depreciation of these dairy buildings amounted to $6122.41, or 5.6 per cent of the average yearly investment of $108,455.25. Investment in Orange County buildings amounted to $23,499.17, with a depreciation figure of $1216.46.

These 40 dairies utilized 117¼ acres of land in dairy building sites and corrals, which at going rental rates possessed an annual value of $3985, or close to $34 per acre. Investment in improvements ranged from $38.50 to $2316.32 for the individual dairies. Four dairies had invested less than $100, 23 from $100 to $500, 10 from $500 to $1000, and 3 over $1000. Depreciation of these improvements amounted to $2135.76 during the year, or 11.4 per cent of an investment amounting to $18,687.94. Eighteen dairies spent a total of $609.55 on upkeep, this being 3.2 per cent of the investment. Of the totals, Orange County contributed 33¼ acres of land valued at $1092.50, an investment of $6909.87, and depreciation of $904.45.

The 40 dairies covered by the study included a variety of dairy equipment, of which the more important consisted of 9 milking machines, 39 wheelbarrows, 104 forks, 71 shovels, 32 feed carts, 143 milk pails, 26 milk tanks, 41 milk coolers, 7 boilers, 33 lanterns, 3 feed trucks, 6 scrapers, 12 scales, 19 tubs, 37 sterilizers, 3 refrigerating systems, 4 feed boxes, and additional, though minor equipment in the way of milk cans, testing outfit, veterinary outfits, milking stools, bull staffs, chains, ropes, and similar items. The total investment in dairying equipment amounted to $12,666.93, of which $1865.19 was invested on Orange County dairies. The investments ranged from $19.03 to $2900. Twelve of the dairies in the district had less than $50 apiece invested, 8 had from $50 to $100, 13

Fig. 14.—Representative dairy structures of the Los Angeles-Orange area.

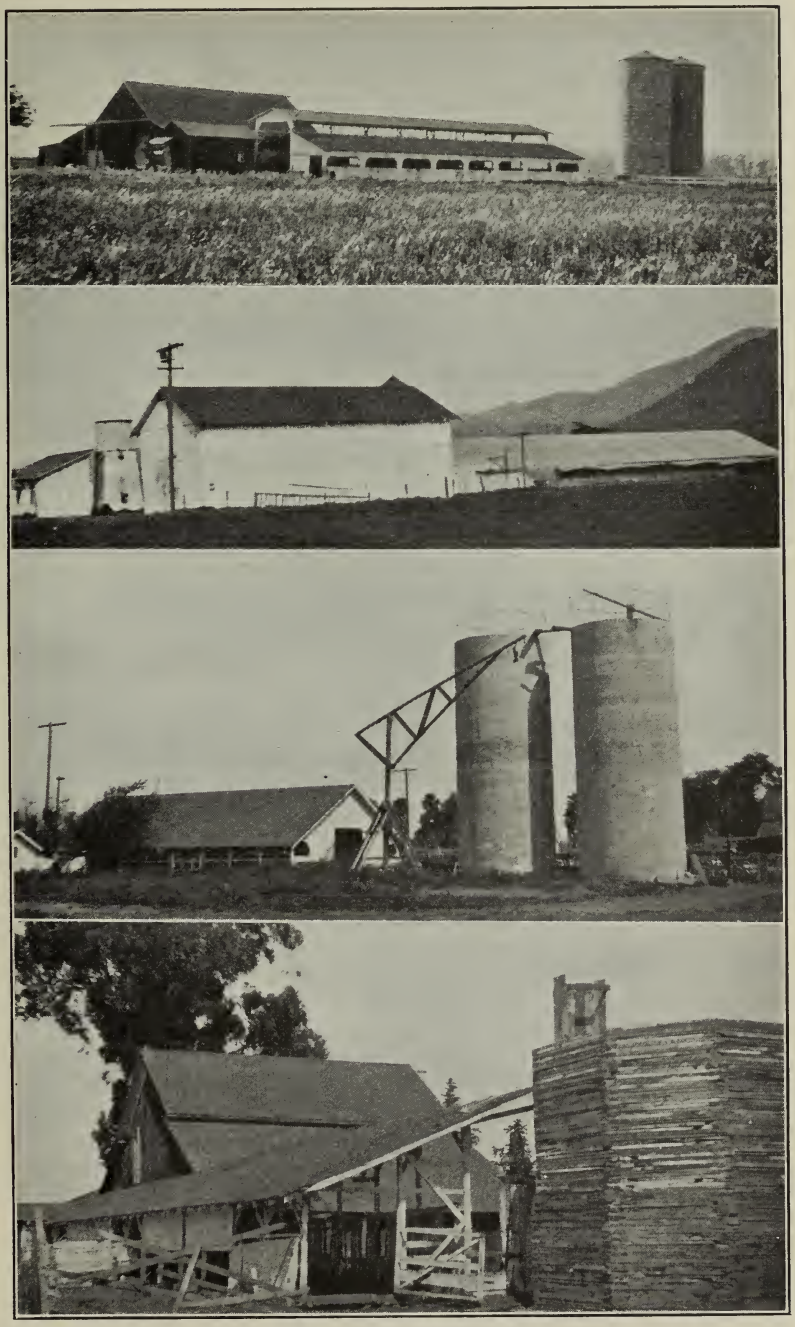

Fig. 14.—(*Continued*)

between $100 and $500, five from $500 to $1000, and two in excess of $1000. Depreciation amounted to a total of $2688.94, to which Orange County dairies contributed $294.64. Based on the total investment in the district, $12,666.93, depreciation amounted to 21.2 per cent for the year. Every dairyman spent something on upkeep of his dairy equipment, ranging from 42 cents to $341.25, and totaling $1906.09, or 15 per cent of the investment in equipment.

No miscellaneous receipts were noted except from sales of feed sacks and $166 for bull service and boarding cows. The credit for sack receipts has been deducted from the cost of concentrates, and the herd credit shows in that portion of the summary table dealing with herd charges.

From an average of 2242 cows carried in these herds during the year, 1527 calves were either sold for veal or retained for rearing. The common practice is to sell veal calves when but four or five days old, or by the time that the mother's milk is fit for human consumption. Should a calf be saved for raising, the general practice is to feed 1½ gallons of whole milk until the calf is three months old. Occasionally less feeding is done, as one gallon of milk daily, or else whole milk is replaced with skimmilk fortified with some form of calf meal, this feed being continued until the calf is four or five months old. A very few calves were reported as receiving in excess of 1½ gallons, rates of 2 and 2½ gallons of whole milk being recorded. Lack of skimmilk and value of whole milk tends to close culling and early sales. Most dairymen valued these calves by the time that the cows' milk could be sold at $3 or $4 per head for all either saved or vealed. The lowest figure reported was $1.50, the highest figure $100, this latter value being for calves from purebred, registered stock. The total values for the 1527 calves saved amounted to $8368.62, or $5.48 per head. Orange County dairies saved 213 calves valued at $1071.

Manure is a substantial credit. Without a single exception every dairy deemed the manure of value either for the returns secured if sales were made or for the benefits derived from its use upon the operator's land. Twenty-seven dairymen reported sales in varying amounts. In all, the value of the manure produced, whether sold or used on the ranch where it was produced, amounted to $28,928.88. This is equivalent to $12.90 per cow per year. Sales were reported at various figures, although prices of 3, 4, 5, and 6 cents per cubic foot were most frequently encountered. Manure from Orange County dairies amounted to $6128.50.

The great bulk of the milk produced by these dairies was sold as whole milk but paid for in accordance with its butterfat content. Occasionally, in times of a surplus or with milk not up to standard, a little milk was skimmed and the butterfat sold. Out of a total production of 18,019,576 pounds of whole milk produced, fully 97 per cent was sold, with but 3 per cent retained on the ranch for home use or for feeding calves. This milk contained a total of 692,993.1 pounds of butterfat, the milk thus testing on an average 3.84 per cent butterfat, but ranging from 3.3 to 4.4 per cent. Of the total, Orange County contributed 3,133,060 pounds containing 132,672.3 pounds of butterfat.

In the entire district the only swimmilk reported consisted of 1664 pounds valued at but $4.16, so for all practical purposes skimmilk is not to be considered a factor in the milk production of this district.

The average records made by the 2242 cows in this district amounted to an annual production of 8041 pounds of whole milk, containing on an average 309.2 pounds of butterfat. The lowest record reported for the district was one of 4389 pounds of whole milk containing 169.9 pounds of butterfat. This was for a herd of 90 cows. Based on the average per cow whole milk production, only two herds

averaged less than 6000 pounds per cow, while ten dairies were above 9000 pounds and three herds above 10,000 pounds per cow. Measured on butterfat output only, four dairies fell below an average herd average of 250 pounds, while thirteen were above a 350 pound average, and two made over 400 pounds per cow. These last two contributed 42 and 75 cows respectively. The best herd average ran 10,205 pounds of whole milk per cow, on the 42-cow dairy, while the best butterfat yield averaged 421.1 pounds per cow per year, on the 75-cow dairy. The average production for the Orange County dairies' cows ranged from 6368 to 9557 pounds of whole milk to the cow, or from 245.2 to 388.2 pounds of butterfat a cow a year, with a general average for all herds studied in this county of 7982 pounds of whole milk or 338.0 pounds of butterfat to the cow per year.

Based on actual sales of milk at wholesale the average price received from the dairymen whose activities were covered by this study and whose operations permitted the drawing of deductions, amounted to $3.50 a hundred pounds of whole milk, or 91.5 cents a pound of butterfat sold in whole milk.

Costs of Production by Individual Dairies

The individual costs of producing whole milk on each of the 40 dairies studied in the Los Angeles-Orange district together with the amounts of the various items entering into these costs are set forth in table 18. Based on these individual dairies the cost, though averaging 97 cents a pound of butterfat, actually varied from as low as 67.5 cents to as high as $1.34 a pound of butterfat produced. Of the 40 dairies the cost ran above $1.00 a pound on 17 dairies.

The dairies numbered from 123 to 143 inclusive were in Orange County, those from 82 to 93 inclusive and 352 to 367 inclusive in Los Angeles County, and those from 400 to 404 inclusive in San Bernardino County.

9. SAN DIEGO DISTRICT

Brief Description of Area

The study in San Diego County was completed with 13 dairies. These were summarized and are here inserted at the request of those in this county who are interested in learning the outcome of the survey in this particular section. Of the 18 dairies listed for record-taking, 5 dropped out, thus leaving 13 only for the final summarizing and analyzing. These 13 dairies were scattered generally over the county in the various valleys where dairying is carried on. There is no single outstanding dairy belt, dairies being located here and there in areas favorably situated for feed production and marketing of product. These dairies are all contributory to San Diego, but are located as follows: 5 near Escondido, 2 near San Diego, and 1 each near Oceanside, Ramona, San Marcos, Barrett, Bonita and El Cajon.

TABLE 18

Average Cost and Production per Cow for Individual Dairies in the Los Angeles and Orange District

Dairy No.	Ave. of Dist.	123	124	125	126	129	131	134	136	137	138	140	141	142	143	82	83	89	90	91	92
No. of cows	2241	11	23	17	19	25	24	18	68	27	13	24	57	34	32	26	59	75	57	36	27
Cost items:	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Labor	66.36	54.55	47.30	74.00	66.06	79.58	73.17	89.75	86.44	65.00	91.56	67.92	86.38	95.85	57.43	65.88	71.68	137.12	67.15	68.33	77.21
Feed	178.97	152.51	173.58	188.04	168.23	172.97	156.07	263.23	148.68	178.30	188.14	253.04	180.63	189.47	182.84	198.02	138.74	211.82	151.11	167.55	208.64
Minor items	22.31	24.50	25.11	23.09	34.22	37.19	32.72	35.83	28.09	31.14	26.32	30.52	34.88	29.44	27.90	20.77	17.74	14.50	14.81	28.70	44.89
Herd charge	35.68	63.64	66.55	18.73	21.12	138.36	55.51	20.09	81.46	63.67	*7.03	38.59	65.87	27.10	7.15	*11.71	11.54	70.14	13.24	15.38	78.88
Building charge	7.22	4.21	6.10	5.93	4.29	27.41	7.89	15.77	4.63	10.42	4.61	2.55	11.52	9.03	2.61	18.14	14.88	4.58	6.77	2.47	7.78
Corral charge	3.50	7.20	2.32	7.85	5.46	12.13	2.94	18.10	3.51	6.02	6.80	13.34	3.54	7.63	9.17	1.02	4.36	3.42	2.31	2.86	4.23
Equipm't charge	2.42	4.12	1.08	1.42	1.18	5.22	5.48	2.73	2.12	1.55	3.11	2.50	1.12	1.95	.66	2.88	2.30	2.80	1.16	.47	1.74
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Total gross cost	316.46	310.73	322.04	319.06	300.56	472.86	333.78	445.50	354.93	356.10	320.54	408.46	383.94	360.47	287.76	306.71	261.24	444.38	256.55	285.76	423.37
Credits—Calf, manure and herd	16.64	10.66	12.14	14.94	12.84	73.80	11.83	5.22	10.85	19.46	25.96	30.21	11.49	11.77	24.47	26.44	10.42	13.05	15.11	14.71	20.42
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Net cost of whole milk	299.82	300.07	309.90	304.12	287.72	399.06	321.95	440.28	344.08	336.64	294.58	378.25	372.45	348.70	263.29	280.27	250.82	431.33	241.44	271.05	402.95
Production of whole milk, lbs.	8041	6881	6548	6837	8506	9557	8521	9021	6368	6757	8904	9309	9276	7895	8308	8968	7624	10025	7259	8410	9701
Cost per cwt. of whole milk	$3.73	$4.37	$4.73	$4.45	$3.38	$4.17	$3.78	$4.88	$5.40	$4.98	$3.31	$4.06	$4.02	$4.42	$3.17	$3.12	$3.29	$4.30	$3.33	$3.22	$4.15
Production of butterfat, lbs.	309.2	337.2	245.2	306.9	365.2	319.2	312.5	388.2	331.6	307.2	374.0	388.2	345.5	387.8	331.1	376.6	298.1	421.1	322.1	353.6	388.7
Cost per lb. of butterfat in whole milk, cents	97.0	89.1	126.3	99.0	78.7	125.0	103.0	113.3	103.7	109.6	78.8	97.3	107.8	89.9	79.5	74.4	84.1	102.4	74.9	76.6	103.6

* Credit.

TABLE 18—(*Concluded*)

Dairy No.	93	352	353	355	356	358	366	359	360	361	362	363	364	365	367	400	401	402	403	404
No. of cows	42	26	37	26	29	33	44	555	90	61	38	82	61	131	71	50	64	35	40	54
Cost items:	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Labor	56.80	54.14	78.49	62.46	56.23	61.62	42.84	64.21	39.44	62.95	99.87	52.68	77.26	58.31	58.05	41.07	52.36	57.83	60.11	50.37
Feed	199.28	167.22	174.73	211.10	183.74	135.24	161.95	201.40	118.88	171.63	197.02	127.38	194.02	169.78	177.49	152.80	201.44	147.22	161.80	171.78
Minor items	36.08	38.82	4.75	16.58	16.05	15.05	18.02	17.56	10.17	17.32	25.64	20.69	22.67	18.09	15.91	23.70	37.60	28.78	39.39	35.61
Herd charge	28.03	37.18	6.46	58.80	44.93	21.00	39.84	39.67	49.70	8.81	50.05	18.04	.61	42.59	37.24	26.12	*7.35	22.24	20.72	18.69
Building charge	11.94	6.89	1.52	3.45	12.43	3.80	3.98	5.75	2.53	10.26	8.10	7.16	15.70	8.24	4.42	8.98	6.75	5.71	7.31	6.53
Corral charge	4.03	9.15	3.53	5.71	6.67	4.46	3.65	1.77	1.42	2.04	2.03	3.94	5.20	3.21	2.13	2.16	1.86	2.22	2.47	3.97
Equipment charge	1.39	6.04	.27	.95	2.59	.47	5.21	1.95	.81	4.15	5.45	3.64	2.16	1.10	.80	7.93	4.61	2.11	1.29	6.93
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Total gross cost	337.55	319.44	269.75	359.05	322.64	241.64	275.49	332.31	222.95	277.16	388.16	233.53	317.62	301.32	296.04	262.76	304.62	266.11	293.09	293.88
Credits—Calf, manure, and herd	19.60	18.27	16.57	15.34	38.31	16.94	36.68	16.33	10.07	16.75	12.41	12.88	15.16	13.71	16.09	15.40	23.70	19.86	17.88	18.17
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Net cost of whole milk	317.95	301.17	253.18	343.71	284.33	224.70	238.81	315.98	212.88	260.41	375.75	220.65	302.46	287.61	279.95	247.36	280.92	246.25	275.21	275.71
Production of whole milk, pounds	10205	7997	10082	8857	7069	7021	7970	8784	4389	7191	7839	6825	8637	7531	6967	5587	9107	6742	9924	6967
Cost per hundredweight of whole milk	$3.11	$3.77	$2.51	$3.88	$4.02	$3.20	$3.00	$3.59	$4.85	$3.62	$4.79	$3.23	$3.50	$3.82	$4.02	$4.42	$3.08	$3.65	$2.77	$3.95
Production of butterfat, pounds	416.2	332.3	374.9	332.0	278.3	245.2	280.3	292.8	169.9	256.1	279.0	310.7	342.6	271.1	281.4	237.6	385.1	268.3	393.2	280.0
Cost per pound of butterfat in whole milk, cents	76.4	90.6	67.5	103.4	102.1	91.6	85.2	107.8	125.3	101.6	134.6	71.0	88.3	106.1	99.5	104.1	73.0	91.7	70.0	98.5

*Credit.

Ten of the records were taken for the year beginning March 1, 1922, 2 ran from January 1, 1922, and 1 from April 1, 1922.

These 13 dairies utilized 1902 acres of land. The land consisted principally of bottom land used for alfalfa, corn and grain production, and rolling hills from which a negligible amount of pasture was obtained. Pasturing between cuttings of alfalfa or after crops was sometimes practiced but in general pasturing comprised a secondary and rather unimportant factor in the feeding of the milking herd. Six of the 13 dairymen reported no pasture, and the others in many instances had no definite pasture lands. Pasturage, when available, usually took place between December and June for the hill lands, and between March and October on the swamp lands. The size of the holdings ranged from 25 to 500 acres, there being eight of 100 acres or less in size, while the others consisted respectively of 200, 200, 270, 286, and 500 acres each.

Feeds for the milking herd were made up of hay, concentrates, and silage, supplemented with roughage such as green alfalfa, green corn, corn stalks, and some pasture. The feeding program consisted in most instances of year-round feeding of hay, usually alfalfa—although some use was made of barley, oats, and Sudan grass hay, corn silage during some portion of the year but principally in the fall and winter months, and year-round feeding of concentrates. Every one of these 13 dairymen fed concentrates consistently, 12 fed silage, and 12 practiced year round feeding of alfalfa as hay or cut green, sometimes supplemented with green corn. The thirteenth fed oat hay for six months, having available pasturage for the remainder of the year. Considerable choice of concentrates was reported, those in greatest favor being cottonseed meal, barley, beet pulp, bran, mill feeds, with some use of coconut meal, corn meal, rice bran, linseed oil meal, ground oats, and wheat. Six dairymen varied their feeding program to include four concentrates during the year, 2 each fed 5 and 6 kinds, while 1 each fed 2, 3, and 8 kinds respectively. Seven dairymen reported the use of pasture.

The total average number of cows maintained throughout the year in these 13 dairies amounted to 583 head. The sizes of herds ran from 20 to 107. There were four herds of from 20 to 27, four of from 34 to 38, three of 40, 43, and 51 respectively, one of 105, and one of 107. The average of all herds amounted to 45.

Five breeds were represented. Six herds consisted of Jerseys, while the remaining seven consisted as follows: Jersey and Holstein; Holstein and Guernsey; Holstein, Shorthorn, and Jersey; Holstein, Guernsey, and Jersey; Holstein; Guernsey; Shorthorn and Ayrshire.

Both registered and purebred bulls and cows were found on most of the dairies but in this section no inventory was taken of the actual number.

All but two dairymen practiced year round breeding to insure a constant supply of milk. The exceptions bred for either August and September or May and June freshening.

Milking on 12 of the 13 dairies is done twice a day, on the thirteenth three times, at 3 p.m., 1 a.m. and 8 a.m. On one of the other 12 a few of the cows are also milked three times daily. Where twice a day milking was practiced, the hours for milking ranged from

Fig. 15.—Jersey cows. Typical dairy cows of San Diego County.

1:30 a.m. and 1:30 p.m. to 5 a.m. and 5 p.m., with most of the milking taking place at 4 a.m. and 4 p.m. Milking machines were used on five dairies, hand milking being practiced on the others.

All the dairymen gave their nationality as American, one qualifying as Danish-American. The use of American milkers was generally reported with some Indian, German, Italian and English.

On 12 of the 13 dairies, production of market milk was the principal aim. On the thirteenth, butterfat was sold as cream, the skimmilk being made into cottage cheese and sold wholesale. During the year, sales of whole milk (and cream in one case) were made to the Milk Producers Association of San Diego County, to Robert Foss of Escondido, to H. B. Weston and to Fred Allen, both of San Diego, and to the San Diego P. M. Dairy.

Ten of the 13 dairymen owned the dairies under their charge, 1 was a tenant, and 2 were superintendents.

Summary of Costs

The various items entering the cost of producing dairy products in this section are assembled in the table immediately following.

TABLE 19

COST OF MILK PRODUCTION SUMMARY—SAN DIEGO COUNTY

Number of dairies	13	
Number of cows	583	
Number of bulls	23	
Costs		
Operating		
Labor		
Man—manual, 85,246 hours	$28,480.00	
Man—management	7,983.00	
Horse, 5,273 hours	939.99	
Truck and automobile, 5,755 miles	575.50	
Insurance	302.43	
Total labor cost		$38,280.92
Feed		
Pasture	$4,105.00	
Hay, 1322.53 tons	28,532.78	
Concentrates, 583.04 tons	24,633.75	
Silage, 1342.1 tons	10,542.52	
Green feed, 1002 tons	6,438.50	
Insurance	118.00	
Total feed cost		74,370.55
Hauling milk		7,199.39
Supplies, cow testing, etc		5,291.95
Interest on operating capital, 6% on $1250		75.00
Herd charge		
Interest on average investment in cattle, $86,939.50 @ 6%	5,216.37	
Mortality: 25 cows, $3243; 1 bull, $50	3,293.00	
Depreciation	5,097.50	
Taxes	748.27	
Insurance	10.00	
Gross herd charge	$14,365.14	
Credits	6,163.55	
Net herd charge		8,201.59
Building charge		
Interest on average investment of $31,944 @ 6%	1,916.64	
Depreciation	1,663.00	
Upkeep	636.75	
Taxes	164.14	
Insurance	186.95	
Total buildings charge		4,567.48

Corral charges		
Use of land, including taxes	$274.50	
Interest on investment in improvements, $7,395.50 @ 6%	443.73	
Depreciation of improvements	908.00	
Upkeep	19.82	
Total corral charge		1,646.05
Equipment charge		
Interest on average investment of $9,147 @ 6%	548.82	
Depreciation	1,842.25	
Upkeep	1,476.71	
Taxes	34.14	
Total equipment charge		3,901.92
Total gross cost		$143,534.85
Credits		
Manure	$5,546.00	
Calves, 444	4,674.97	
Total credits	$10,220.97	
Net cost of whole milk		$133,313.88
Total production of whole milk		3,629,419 pounds
Cost per hundredweight of whole milk		$3.67
Total production of butterfat in whole milk		155,923 pounds
Cost per pound of butterfat in whole milk		86 cents
Average annual production per cow		6225 pounds of whole milk 267.3 pounds of butterfat

Comments on Costs Findings

The 13 herds included in the study conducted in San Diego County were assessed for taxes at $17,360. Dairy equipment assessments amounted to $900. Prorata of building assessments, chargeable against the dairy, amounted to $3850. The tax rate varied from $2.71 to $5.64 per $100 of assessment. The amount of taxes paid totaled $748.27 on dairy cattle, $164.14 on buildings, and $34.14 on dairy equipment.

Insurance was carried on buildings, workmen, cattle, and feed. Ten dairymen carried insurance on buildings, 7 on employers' liability, 1 on cattle, and 3 on feed. The amounts carried are shown in table 19.

The average cost for manual labor used on these 13 dairies amounted to 33.4 cents per hour. Twelve of the dairymen placed a figure for time spent in management, amounting to about 28 per cent of the manual labor expenditure.

Horse labor was utilized on but four dairies, and cost from 8.1 to 27.6 cents per hour. The average cost amounted to 17.8 cents per hour. Total use amounted to 5273 hours.

One truck and three automobiles figured in carrying on the dairy work on as many dairies. Cost of operating averaged 10 cents a mile for a total use of 5755 miles.

The general practice in feeding has already been touched upon. Pasturing was practiced by only 7 per cent of the 13 dairymen. For those who pastured,

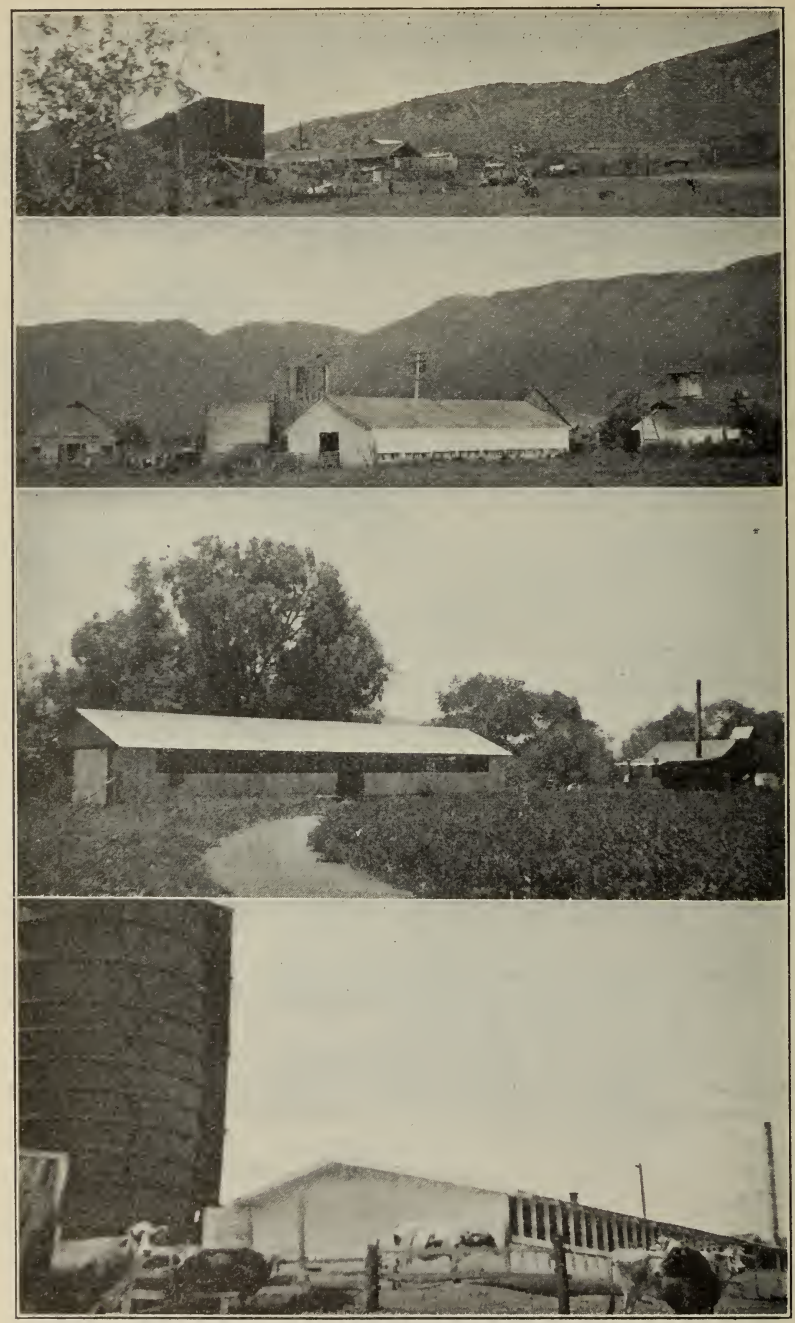

Fig. 16.—Typical dairy layouts and conditions where studies were conducted in San Diego County.

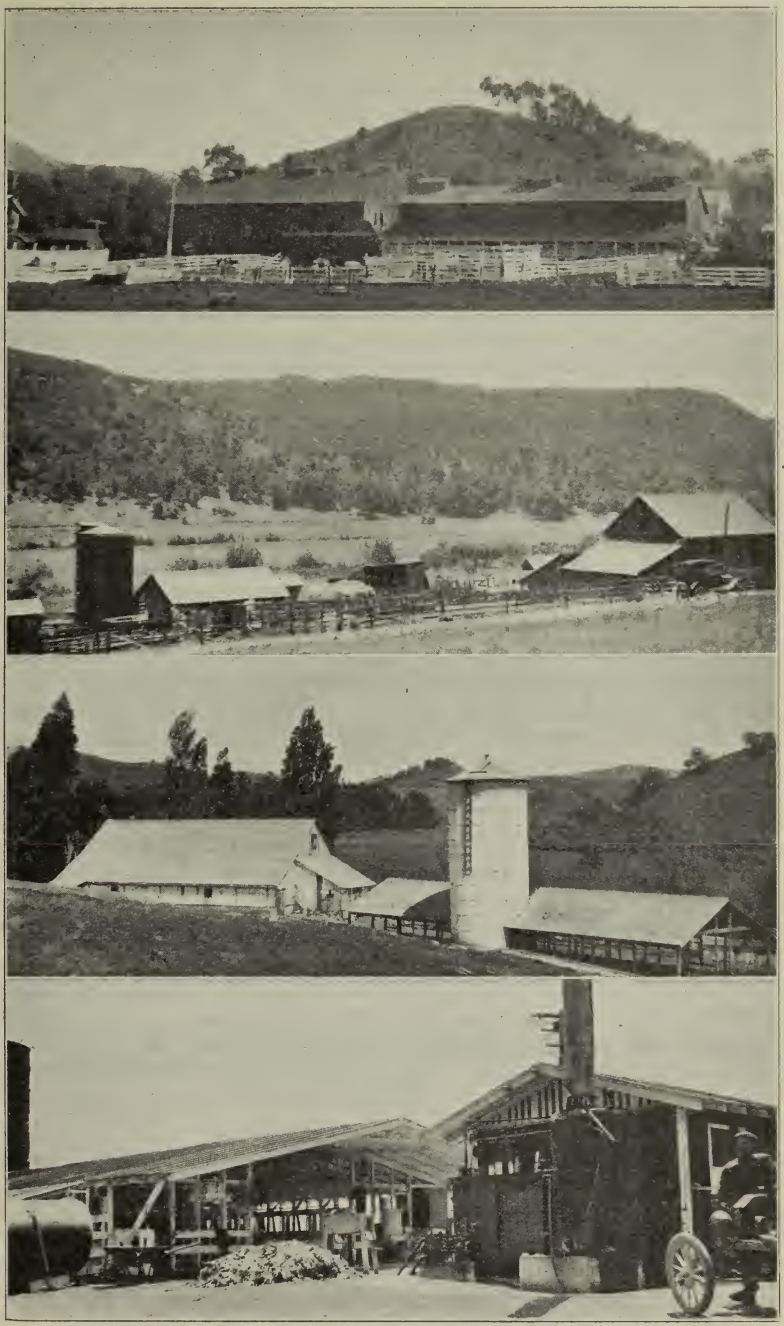

Fig. 16.—(*Continued.*)

the cost was $12.59 per cow per year. The cost per ton of feeds used during the year on these 13 dairies averaged: Hay, $21.57; concentrates, $42.67; silage, $7.86; green feed, $6.42.

Totals spent for contract hauling, purchase of supplies, payments for cow testing, and similar items are set forth in the table. Nine of the 13 dairymen paid for contract hauling, while all had miscellaneous expenditures to meet. Operating capital amounted to $1250, most of the dairymen running bills during the month and paying for them with the milk check so that operating capital remained at a rather low level.

The investment in milking herds during the year that these dairies were under observation amounted to $86,939.50, of which $7500 was in bull values and the balance in cows. Bulls, therefore, made up slightly more than 8 per cent of the total and cows slightly less than 92 per cent. Average cow values of individual herds ran from $77.50 a head to $277, with an average value for the district of $136.26. Bull values ranged from $100 to $700, averaging $326.

Based on sales, deaths, purchases, and heifers brought into the milking strings, the 13 dairies registered an appreciation in the value of the cows maintained, amounting to $1126.05. Five dairies reported appreciation in their milking herds, while eight reported a depreciation. Bulls showed a net depreciation of $160, thus bringing the net appreciation of both cows and bulls to $966.05.

During the year covered by the record-taking, 25 cows died valued at $3243, and 1 bull valued at $50. Based on the average number maintained in the milking herds, this amounted to 4.4 per cent of the cows, and 4 per cent of the bulls. The average value of cows dying amounted to close to $150, or an average higher than the average value reported for all the cows covered by this study.

Dairy building equipment consisted of a milking barn and milk house on each dairy, with one dairy possessing a second milk house, 14 silos on 11 dairies, and 13 shelter and feed barns on 11 dairies. The investment in dairy buildings varied from $616 to $6047, with an average investment of $2457. The investment on the different dairies was variable, 2 dairies having an investment of less than $1000, 5 of from $1000 to $2000, 2 of from $2000 to $3000, while the remaining 4 had investments of $3969, $4115, $4859, and $6047. Seven dairymen spent money for building upkeep, ranging from $8 to $445, and totaling $636.75, which was 2 per cent of the investment in buildings. Depreciation of dairy buildings totaled $1663 and thus amounted to about 5 per cent of the investment.

Land required for corrals and dairy buildings totaled 57 acres, having a rental value of $274.50, or $4.82 per acre per year. The investment in improvements such as fences and watering facilities amounted to $7395.50, ranging from $95 to $1194, and averaging $568.88. Depreciation of these improvements totaled $908, or a little over 12 per cent of the investment. Upkeep of corrals necessitated but little expenditure.

Dairying equipment reported consisted of 2 separators, 9 milking machines, 237 milk cans, 50 milk pails, 5 milk vats, 11 sterilizers, 12 aerators and vats, 5 boilers, 3 scales, 6 washtubs, 8 wheelbarrows, 3 milk fever outfits, 3 veterinary outfits, 2 refrigerating machines, 17 hay forks, 12 brooms, 8 shovels, 15 lanterns, and miscellaneous items as feed carts, fuel tank, mixing bin, litter truck, silage trucks, dehorner, scrapers, fly sprayers, gas engine, motor, milk testing outfit, and wagon. The total investment in these items amounted to $9147, ranging on the different dairies from $28 to $1968, with an average investment of $703.61. All

dairymen found it necessary to make expenditures for dairy equipment upkeep, the total amounting to $1476.71, or close to 16 per cent of the average yearly investment. Depreciation of dairy equipment amounted to $1842.25, or about 20 per cent of the investment.

Miscellaneous returns consisted of receipts from sales of feed sacks amounting to $243.50, and bull service amounting to $100. These items were credited directly to the department concerned.

A total of 444 calves was reported as a credit to the dairies, amounting to $6474.97, or averaging $14.58 per head at the time that the dam's milk was fit for human consumption. Values reported ranged from $1.50 to $75 per head.

Sales of manure from the dairies amounted to $572, which added to the value ascribed to the manure used on the ranch totaled $5546.

The total production from these 13 dairies stated in terms of whole milk amounted to 3,629,419 pounds containing 155,823 pounds of butterfat. The tests ran from 3.7 to 5 per cent butterfat, with an average test for the total production of 4.3 per cent. Of the total production, 88 per cent was sold, the remainder being used by the dairymen's families or for calves. Family use totaled 8256 gallons or 71,001 pounds.

The average production per cow per year made by the 583 cows studied in this district amounted to 6225 pounds of whole milk or 267 pounds of butterfat. Based on herd average performance, the lowest yield for a single dairy amounted to 177 pounds of butterfat; the highest, 434 pounds. Figured as whole milk, the lowest annual average per cow was 4303 pounds; the highest, 11,152 pounds. Of the 13 dairies, the average of 6 was below 250 pounds of butterfat per cow per year. The average of 10 was under 7000 pounds of whole milk per cow per year.

Based on actual sales of whole milk made from the dairies which confined their activities to the production of whole milk for the wholesale market, the average price received throughout the year amounted to $3.57 a hundredweight of whole milk. This is equivalent to 80.2 cents a pound of butterfat contained in the milk sold.

Cost of Production by Individual Dairies

For purposes of showing the wide range in the amounts of the different items entering into the cost of producing milk as reflected by individual dairies, as well as to permit the making of comparisons, table 20 sets forth the cow cost for each group of items which are shown summarized in the district table already presented for each of the 13 dairies. The cost of producing whole milk ranged from a low of $2.57 to a high of $5.43, with an average of $3.67 a hundredweight. In terms of butterfat, since this is the basis upon which the dairymen are paid, the range was from 65 cents to $1.10, with an average of 86 cents a pound. Six men produced at or below the average cost for the district, the remaining seven above.

TABLE 20

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE SAN DIEGO DISTRICT

Dairy No.	Aver. of District	176	177	178	179	180	183	184	185	187	188	332	333	335
No. of cows	583	38	27	35	20	105	51	37	107	21	40	34	43	25
Cost items:														
Labor	$65.66	$62.97	$60.90	$57.63	$87.00	$50.50	$40.70	$37.41	$62.87	$102.38	$54.01	$58.09	$119.64	$142.68
Feed	127.57	196.89	122.03	117.62	90.96	85.36	94.99	78.32	149.73	274.28	123.05	99.05	198.79	93.38
Minor items	21.55	31.46	25.02	27.13	48.33	20.35	14.00	33.72	10.96	12.10	27.60	19.20	29.70	8.80
Herd charge	14.07	24.90	49.50	53.14	17.67	14.46	9.78	7.23	23.60	*76.94	28.22	2.32	* .61	*26.78
Building charge	7.84	4.36	5.96	9.42	7.39	4.69	3.50	9.29	8.68	4.93	3.04	7.33	17.55	23.63
Corral charge	2.82	4.31	5.25	4.58	1.54	3.96	.64	2.29	2.96	2.24	2.00	1.13	.70	4.17
Equipment charge	6.69	3.79	10.38	3.39	3.86	4.63	5.26	4.35	8.89	.99	4.25	16.69	11.25	6.92
Total gross cost	$246.20	$328.68	$279.04	$272.91	$256.75	$183.95	$168.87	$172.61	$267.69	$396.92	$242.17	$203.81	$377.63	$279.58
Credits—Calf, manure, herd	17.53	7.34	9.26	5.89	7.90	5.87	7.51	8.11	7.61	110.13	29.50	6.00	55.95	136.78
Net cost of whole milk	$228.67	$321.34	$269.78	$267.02	$248.85	$178.08	$161.36	$164.50	$260.08	$286.79	$212.67	$197.81	$321.68	$142.80
Production of whole milk pounds	6225	7119	5812	5931	6023	5726	5489	6259	7434	11152	5488	4303	5924	4432
Cost per hundredweight of whole milk	$3.67	$4.51	$4.64	$4.50	$4.13	$3.10	$2.94	$2.63	$3.50	$2.57	$3.88	$4.59	$5.43	$3.23
Production of butterfat, pounds	267	306	279	264	301	240	247	231	297	434	246	210	292	177
Cost per pound of butterfat in whole milk, cents	86.0	105.0	97.0	101.0	83.0	74.0	65.0	71.0	88.0	66.0	86.0	94.0	110.0	81.0

* Credit.

10. SAN LUIS OBISPO COUNTY

Brief Description of Area

Twenty dairies are included in the findings for San Luis Obispo County, the records covering the year from January 1, 1922, to January 1, 1923, in all cases. The dairying belt, of which the dairies reported in this study are a part, lies along the coast between Cayucos and Cambria, centering around Harmony. Five of the dairymen gave their address as Cambria, 3 as Cayucos, and 12 as Harmony. Dairying is a major and important enterprise in this section, being conducted on the rolling hills and small valleys, with much of the land in pasture, although suitable areas are cropped. The buildings are located in the cañons, and the similarity in arrangement and type of construction is rather striking, one dairy being largely patterned after another. A total of 12,056 acres was utilized by these 20 dairies of which 9879 acres were reported as being maintained in permanent pastures. Hence with an average holding of about 600 acres, 82 per cent was used for pastures and 18 per cent cropped. The smallest holding of the 20 amounted to 160 acres: the largest was 1366 acres. Eight holdings were less than 500 acres in extent; 10 of from 500 to 886 acres; and 2 of more than 1300 acres, these 2 being 1320 and 1366 acres respectively.

Oat hay was the common roughage. A little alfalfa was grown. Although two or three silos were under construction at the conclusion of the year covered by this study, not a single one of these 20 dairymen had an available silo in use during this study. Nearly all hay was fed loose. Outside of a little hay sold to local dairymen when themselves short of feed, there is practically no market, the hauling charge to the nearest shipping point during ordinary years being prohibitive. Rolled oats was the more common concentrate fed. A little cottonseed meal, beet pulp and middlings were used by some men. Two or three used carrots, squashes, pumpkins, and beets raised on an acre or two of ground.

Pasture was more or less available the year round. The cows were out at all seasons. The best of the pasture season, however, was from April to October, supplementary feeds of hay, roots, squashes, and concentrates being utilized during the remainder of the year, in amounts depending upon the carrying capacity of the pasture. Pasture is largely made up of alfileria, bur clover, foxtail, wild oats, broncho grass, and similar common coast range feeds.

Fig. 17.—Typical range conditions of the San Luis Obispo area. Feeds consist largely of alfilaria, bur clover, fox tail, wild oats and broncho grass. The best of the pasture is available from April to October.

These 20 herds contained a total of 1329 cows, in herds ranging from 16 to 167 animals. Only a single dairy of the group had less than 30 cows, 11 dairies had from 33 to 62 cows; 6 dairies from 65 to 98 cows; and 2 dairies over 100 cows, these containing 145 and 167 cows respectively.

Of the 20 herds, 15 were classified as scrubs; 3 herds as grade Shorthorns; 1 grade Jersey; and 1 a mixture of grade Jerseys and grade Shorthorns. Three dairies possessed a total of 4 registered bulls, consisting of 2 Jerseys and 2 Shorthorns. Two registered Jersey heifers were recorded.

The common practice is to permit the bulls to run with the cows so that freshening will take place during October, November, and December, drying up the cows for the months of July, August, and September.

Most of the labor was done by the family. When men are hired, they are expected to pitch in with the family, lend a hand not only at milking but also in the fields during plowing, planting, and harvesting. The usual work day is from 12 to 14 hours in length. Most milking is done at 4 A.M. and again at 4 P.M.

Swiss predominated in the nationalities of the dairymen, 17 dairymen being so designated, although commonly American-born. The three remaining dairies were reported to be in the hands of Americans. Swiss, American, Italian, Spanish, and German-American milkers were recorded. Both milk and cream were sold, the former to be made into cheese. All milk or cream was sold on a butterfat basis, and all sales by the dairymen in this group were made to the Harmony Valley Creamery Association. Those who sell cream have their skimmilk for home use, and those who sell whole milk get the whey back, these by-products being used in feeding calves and hogs. Buttermilk from the manufacture of butter is retained by the creamery.

Of these 20 dairies, 12 were in the hands of tenants, 6 were operated by the owners, and 2 were under a combination of owner-tenant.

Summary of Costs

The various cost items involved in the production of milk on the 20 dairies studied in San Luis Obispo County are assembled and set forth in table 21.

TABLE 21

COST OF MILK PRODUCTION SUMMARY—SAN LUIS OBISPO COUNTY

Number of dairies		20
Number of cows		1329
Number of bulls		37
Costs		
Operating		
Labor		
Man—manual, 156,051 hours	$37,296.19	
Man—management	6,064.43	
Horse, 12,769 hours	2,805.06	
Truck and automobile, 27,198 miles	2,922.01	
Total labor cost		$49,087.69
Feed		
Pasture	$13,512.21	
Hay, 2264 tons	33,960.00	
Concentrates, 222.97 tons	7,598.77	
Pumpkins, squashes, carrots	723.00	
Green alfalfa, 205 tons	1,025.00	
Straw, 20 tons	200.00	
Total feed cost		57,018.98
Supplies, cow testing, hauling, cream, etc		2,635.45
Interest on operating capital, 6% on $7900		474.00
Herd charge		
Interest on average investment in cattle, $101,480.51 @ 6%	6,088.83	
Mortality: 43 cows, $2770; 3 bulls, $185	2,955.00	
Depreciation; cows, $1610; bulls, $888	2,498.00	
Taxes	881.35	
Insurance	none	
Total herd charge		12,423.18
Buildings charge		
Interest on average investment of $50,514.50 @ 6%	$3,030.87	
Depreciation	1,311.00	
Upkeep	478.00	
Taxes	210.50	
Insurance	190.48	
Total buildings charge		5,220.85
Corral charge		
Use of land, including taxes	$78.00	
Interest on investment in improvements, $7,779 @ 6%	466.74	
Depreciation of improvements	451.10	
Upkeep	60.00	
Total corral charge		1,055.84

Equipment charge			
Interest on average investment of $15,059.96 @ 6%		$903.60	
Depreciation		1,550.25	
Upkeep		718.70	
Taxes		30.89	
Total equipment charge			3,203.44
Total gross cost			131,119.43
Credits			
Manure	$450.00		
Calves, 1165	5,601.00		
Skimmilk, 5,107,072 pounds @ 20 cents per 100 pounds	10,214.16		
Total credits	$16,265.16		
Net cost			$114,854.27
Total production of butterfat			214,340.2 pounds
Average cost per pound of butterfat			53.6 cents
Average annual production per cow			161.3 pounds of butterfat

Comments on Cost Findings

The livestock belonging to the 20 milking herds from which the data were taken were assessed at $34,989, of which $1890 drew a tax rate of $2.85, with the balance at $2.50. The assessment on dairy buildings amounted to $8350, of which $500 was at the rate of $2.85. Dairy fixtures assessments amounted to $1225, $75 being at the tax rate of $2.85. One dairy was in a community with a tax rate of $2.85 per $100; the tax rate for the remainder being at $2.50 per $100.

Eleven of the 20 dairymen carried building insurance. No workmen's compensation nor cattle insurance were reported.

On an average, the cost of manual labor used by these dairies amounted to 23.9 cents per hour. Management amounted to 16.3 per cent of the manual labor cost.

The cost of horse labor varied from 10.4 to 44.1 cents per hour, the average being 21.9 cents per hour. The rather high rate holding for this community is traceable to the use of saddle horses, every dairy keeping one and one dairy keeping two which, used but a relatively short time each day, resulted in a rate somewhat higher than might otherwise be expected. Teams are used for dairy purposes only once or twice a year, and then for only about a week's time in cleaning corrals. The cost on four dairies was over 40 cents per hour and over 30 cents on three more.

Only one man had contract provision for hauling his output to market, the rate being ¼ cent a butterfat pound; the other 19 dairymen maintained 14 trucks and 5 automobiles for this purpose. Cream was hauled every two days and milk every day, as a rule. The average cost of operation, based on total work done, amounted to 10.7 cents per mile, with a range of from 8.2 cents to 27.1 cents per mile. The dairy work required travel to the extent of 27,198 miles.

Of the 9879 acres of pasture actually used by the group of dairies studied in this section, 66.6 per cent was utilized by the milking herd, or a total of 6581 acres. The value of this pasture amounted to $13,512.21, or $2.05 per acre. This

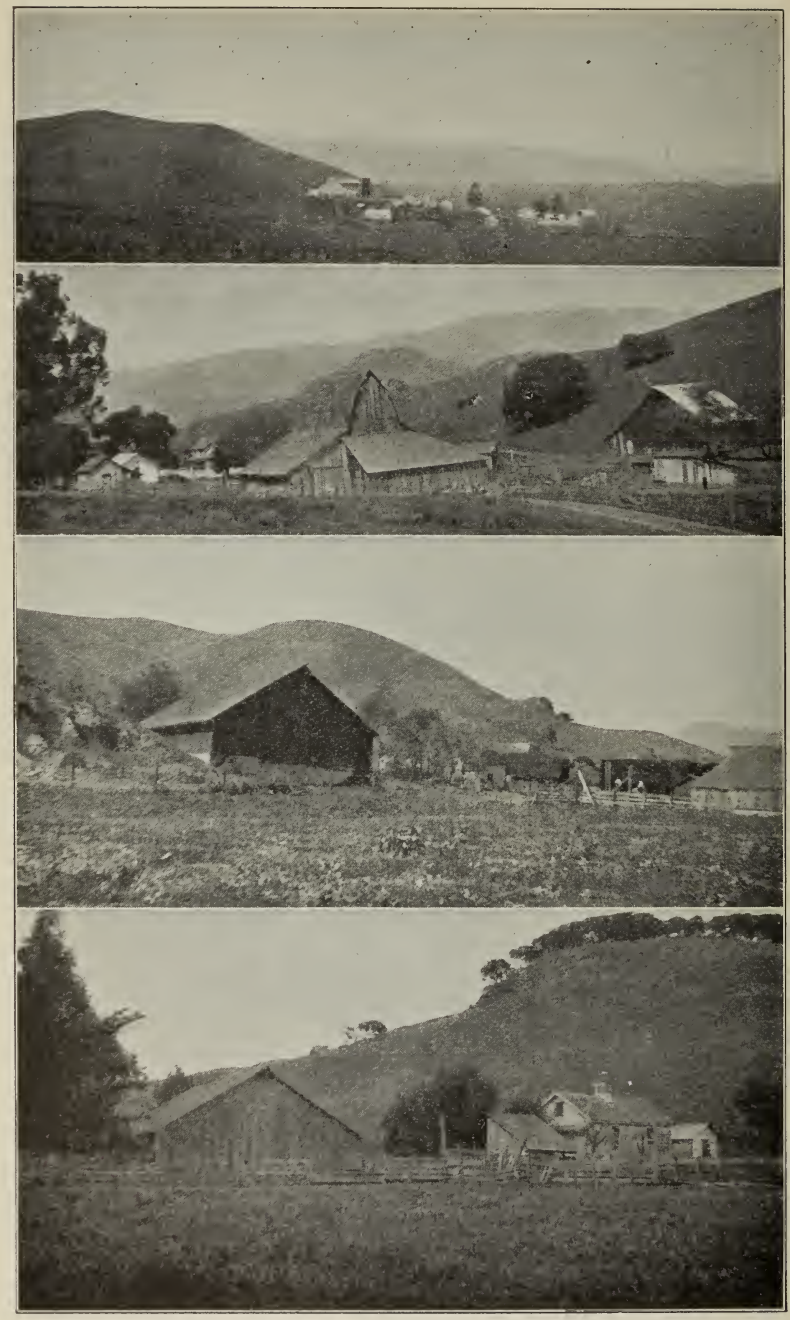

Fig. 18.—Types of dairy buildings of the San Luis Obispo section.

Fig. 18.—(*Continued.*)

meant an average use per cow per year of close to 5 acres, thus necessitating a cost figure of $10.25 per cow per year for pasturage, a figure that includes pasturage used by bulls. To supplement the pasture, these 20 dairies fed 2264 tons of hay at an average value of $15 per ton; 222.97 tons of concentrates at an average cost of $34.03 per ton; 150 tons of pumpkins, squashes, and carrots at $4.82 per ton; 20 tons of straw at $20 per ton; and 205 tons of green alfalfa at $5 per ton. Some difficulty was experienced by the dairymen in their efforts to set feed values. The task was easy enough with concentrates because practically all are purchased and shipped in, but with hay, green alfalfa, and pasture some trouble was experienced in getting at a proper figure because of the limited sales and small demand. Ultimately, an acceptable figure was secured.

Operating capital required by the 20 dairies amounted to $7900, or an average of $395 per dairy.

Miscellaneous operating expenses for fuel, power, and other items ranged from $29.50 to $513.26, the total being $2614.37.

Cow values for the livestock comprising the milking herd taken from an average of the two annual inventories ranged from $60 to $90 per head. Seven dairymen valued their cows at $75 per head, and six more at $67.50. The average for all the cows included in the study amounted to $73.12 per head. Bulls were priced at from $32.50 to $443 each, with an average value of $116.50. Thirteen dairies were being operated with bulls valued at less than $75 each. Of the total average investment in cows and bulls, about 4 per cent was in bull values and 96 per cent in cows.

In assembling data in connection with herd depreciation, six dairies figured an appreciation in their cow values amounting to $2459, which served to cut the total depreciation accruing to the other 14 dairies to a net figure of $4069. Net cow depreciation, therefore, amounted to $1610. One bull appreciated in value to the extent of $5, but the other 36 fell off in value to the amount of $893, thus leaving a net depreciation in bulls for the district of $888.

Forty-three cows died, or a little over 3 per cent of the average number maintained in the herds under study. These were reported as having a value of $2770, or $64.42 per head. This amounted to about 88 per cent of the average value reported for all animals. Three bulls, having a total value of $185, died. The total herd mortality, made up of both cows and bulls, amounted to $2955.

Dairy building equipment for the 20 dairies consisted of a dairy barn and milkhouse for each dairy, and 18 granaries on as many dairies. Nine dairies expended money for building upkeep, ranging from $5 to $225, and totaling $478, or slightly less than 1 per cent of the investment. The investment in building equipment varied from $587.50 to $5455. Three dairies were using equipment valued at less than $1000; the dairy buildings on five dairies ranged from one to two thousand dollars; on six dairies from two to three thousand dollars; on four dairies from three to four thousand dollars; and on two dairies was in excess of four thousand dollars. The average for the 20 amounted to about $2500.

Thirty-seven and one-half acres of land were in use for building sites and corrals, this acreage possessing a rental value of $78. This amounted to an average acre rental of $2.07. Investment in improvements ranged from $72.50 to $1292, amounting to a total of $7779, or an average of $389 per dairy. Twelve dairies had less than the average invested and eight had more. The depreciation of these improvements amounted to from $5 to $66.25, or an average for the 20 dairies of $22.55. This is equivalent to practically 10 per cent of the investment.

Only five dairymen found it necessary to spend cash for corral upkeep, with the total thus spent amounting to but $60, or only 7/10 of 1 per cent of the investment.

The investment in dairy equipment ranged from $217.85 to $2253.90, with an average of $753. Ten dairies had an investment of less than $500, while five each had invested respectively between $500 and $1000, and five more than $1000.

The 20 dairies were equipped with 7 milking machines, 23 separators, 24 gasoline engines, 22 milk vats, 19 kettles, 3 boilers, 22 milk strainers, 5 coolers, 99 milk pails, 70 pitchforks, 25 shovels, 3 scrapers, 19 wheelbarrows, 228 milk cans, 48 lanterns, and necessary shafting, belting, and sinks. Four veterinary outfits, a water wheel, 1 pair of clippers, 1 pump, 1 lighting plant, 1 set of scales, and the usual complement of brushes and brooms completed the list. All but one of these 20 dairies found it necessary to spend something for dairy equipment upkeep, the sums ranging from 50 cents to $144.75, the total amounting to $718.70, or an average for the 20 dairies of $35.93. Upkeep was 4.7 per cent of the investment in dairy equipment.

No returns of a miscellaneous nature were reported for the dairies. Only sales of milk and cream, with credit for calves, manure, and skimmilk were credited to the dairying operations.

Values per head for calves saved for vealing or rearing ranged from $3 to $8 a head, with most of the dairymen figuring their calves when dropped as being worth $5 a head. The total value of 1165 calves retained amounted to $5601, or an average of $4.81.

Only minor values were assigned by dairymen to the manure produced by the dairy herd. Two dairymen reported it as of no value to them, one dairyman reported the total value as $100, while the rest figured the worth at from $20 to $25. This gave the herds a total credit of but $450 for all manure produced. No sales of manure were made, and this value is based on dairymen's estimates of the value of the manure to them.

All 20 dairies made the sale of cream their primary object, although during the period under observation 7 of the 20 sold some whole milk. The sale of whole milk constituted 15 per cent of the total sales. Of the total production, figured on a butterfat basis, 91.7 per cent was sold, and the remaining 8.3 per cent used either in the home or in feeding calves. Milk tests ranged from 3.7 to 4.2 per cent butterfat, with a general average of 3.8 per cent, with cream separated to test close to 40 per cent.

Estimates of the value of the skimmilk varied from 12 to 30 cents a hundred pounds, with 20 cents a hundred pounds considered the average value for the district. As no sales were made of the skimmilk, values are based solely on dairymen's personal estimates of its feeding value for calves and hogs.

The average annual production per cow amounted to 161.3 pounds of butterfat. The lowest herd average amounted to 107.3 pounds; the highest was 239.5 pounds. The averages for eight herds was below 150 pounds per cow per year, while six more were below 175 pounds. Only four herds averaged 200 pounds or more, the figures for these being respectively 200, 203, 223, and 239 pounds per cow per year.

Prices received by these dairymen based on receipts from actual sales averaged 46.6 cents a pound for butterfat sold as cream, and 48.8 cents a pound for butterfat sold in whole milk.

TABLE 22

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN SAN LUIS OBISPO DISTRICT

Dairy No.	Ave. of Dist.	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
No. of cows	1329	38	58	64	33	37	65	77	73	85	40	47	62	98	167	145	79	39	16	57	49
Cost items:																					
Labor	$36.94	$47.96	$33.66	$30.62	$46.36	$47.18	$32.93	$25.13	$29.08	$51.91	$37.88	$37.54	$34.75	$31.38	$28.42	$44.95	$34.41	$50.82	$56.89	$33.79	$43.96
Feed	42.90	72.59	54.70	39.57	36.99	44.07	25.67	46.79	43.14	46.25	44.10	45.98	38.36	28.40	37.33	50.33	35.16	44.59	53.72	48.38	53.05
Minor items	2.34	1.25	2.62	1.05	2.88	3.38	1.66	2.22	3.89	1.40	3.95	1.26	1.35	1.61	2.31	3.94	2.48	1.38	2.55	1.43	3.13
Herd charge	9.35	4.39	6.47	9.34	8.84	25.96	22.33	12.30	20.60	9.00	7.86	2.29	8.69	7.43	*.61	6.65	14.09	8.91	4.36	16.46	7.02
Building charge	3.93	4.59	5.48	3.39	3.77	6.69	4.90	4.94	4.45	3.66	2.12	3.09	3.92	4.29	2.02	3.62	3.55	6.79	4.19	5.61	2.42
Corral charge	.79	.30	.51	.47	.85	2.01	.37	.76	2.19	.30	.55	.90	1.31	.49	.54	.51	.53	1.62	1.84	1.40	.87
Equipm't charge	2.41	1.08	2.27	1.67	1.84	6.17	2.22	3.28	4.03	2.27	2.33	1.41	1.65	1.66	2.12	2.58	2.64	1.59	2.74	1.50	4.13
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Total gross cost	98.66	132.16	105.71	86.11	101.53	135.46	90.08	95.42	107.38	114.79	98.79	92.47	90.03	75.26	72.74	112.58	92.86	115.70	126.29	108.57	114.58
Credits—Calf, manure, herd	4.55	5.26	4.74	3.44	2.42	9.19	5.31	5.46	5.21	5.12	4.37	4.79	4.68	4.08	4.68	5.14	4.05	2.46	6.25	5.70	
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Net cost of whole milk	94.11	126.90	100.97	82.67	99.11	126.27	84.77	89.96	102.17	109.67	94.42	87.68	85.35	71.18	68.06	107.44	88.81	113.24	120.04	102.87	114.58
Credit for available skimmilk	7.69	8.92	6.63	6.27	6.33	8.60	7.99	7.92	7.05	10.66	7.79	5.15	8.11	7.33	6.55	8.95	7.07	9.41	10.84	6.33	7.85
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Net cost of butterfat	86.42	117.98	94.34	76.40	92.78	117.67	76.78	82.04	95.12	99.01	86.63	82.53	77.24	63.85	61.51	98.49	81.74	103.83	109.20	96.54	106.73
Production of butterfat, lbs.	161.3	186.0	138.3	130.9	136.2	200.1	166.8	164.9	147.8	223.0	162.7	107.3	164.5	153.2	137.1	186.8	147.8	202.5	239.5	132.4	163.1
Cost per lb. of butterfat, cents	53.6	63.4	68.1	58.3	68.1	58.7	46.0	49.7	64.4	44.4	53.3	76.9	47.0	41.6	44.8	52.7	55.3	51.3	45.6	72.8	65.3

* Credit.

Costs of Production by Individual Dairies

The variation in the various items determining costs, such as operating costs, overhead items, and amount of production per cow for the dairies studied in San Luis Obispo County is set forth in table 22. The average for the district is also shown for each item.

The average cost of producing butterfat was 53.6 cents for the twenty dairies under observation. The range was from a low of 41.6 cents to a high of 76.9 cents, 10 dairies producing at or below the average district cost.

11. MONTEREY—SAN BENITO—SANTA CRUZ DISTRICT

Brief Description of Area

Complete records covering a year's business on 33 dairies located in the principal dairying sections of Monterey, San Benito, and Santa Cruz counties were obtained. In the final summary, however, 14 dairies were eliminated, these being situated on rolling hills close to the coast or in the redwoods and hardly comparable with the others. Dairies reported for this district, therefore, are those operating under conditions of irrigated alfalfa and other field crops. Of the 19 dairies finally summarized and analyzed, 9 were in San Benito County, 8 in Monterey County, and 2 in Santa Cruz County, county lines, however, making little difference since these dairies were being conducted under similar conditions and hence comparable, irrespective of geographical boundaries. Of the 19 dairies, 9 were in the vicinity of Hollister, 4 contributory to Watsonville, and 6 close to Greenfield.

Record taking was begun January 1, 1922, on 3 of the 19 dairies, February 1, 1922, on 6, and March 1, 1922, on 10.

These 19 dairies utilized a total of 1944 acres, ranging in size from 25 to 400 acres. Ten of these dairies possessed only alfalfa land, the total area utilized by these 10 amounting to 613 acres, thus averaging 61.3 acres, though ranging from 30 to 100 acres. The dairies using the larger areas, 100 acres or over, usually possessed some swamp land used for pasture, or rolling hills producing grain or pasturage in addition to their cropped fields. All the dairies possessed some alfalfa land.

Some variation in feeding methods occurred on these dairies. In general, the use of pasture, either natural or alfalfa or grain stubble, was available, and used by four dairymen throughout the year. Two dairymen reported the use of pasture for 11 months, while 6 used pasturage intermittently for from 2 to 8 months. Three dairymen reported no pasturage, 1 almost none, and 2 did not give usable

details. When pasturage was reported for less than 8 months, it was usually available during the spring and summer months. Feeding of hay, either alone or as a supplement to the pasturage, was universally reported. Year-round feeding of hay was practiced by 17 of these 19 dairymen, with greatest use of alfalfa hay, although some small quantities of barley, oat, and wild grass hays were occasionally fed. Dairymen who did not feed continuously used other feeds such as silage and concentrates to supplement the pastures. Feeding of concentrates was done only to a very limited extent. Only 1 dairyman fed consistently throughout the year. Eleven men fed none whatever. The remaining 7 fed spasmodically for from 1 to 4 months, the longer feeding being practiced during the winter months to supplement other available feeds. Occasionally, for a month or two, a little use was made of sugar beet tops, green alfalfa, green barley, green grass, potatoes, sugar beet roots, and carrots. Five dairymen used silage made of corn, or corn and sunflowers, while one man put up a little green barley silage. Silage feeding was resorted to during the late fall, winter, and early spring months, for periods lasting from 3 to 8 months.

During the year that these 19 dairies were under observation, an average of 732 cows and 21 bulls were maintained in the milking herds. The size of the individual herds varied from 16 to 71 cows, averaging 38. Seven dairies averaged less than 30 cows in the herd during the year, 10 had from 30 to 60 cows, and 2 had over 60 cows in the herd.

The Holstein cow was outstandingly well represented, 18 of the 19 herds consisting practically entirely of this one breed, while the remaining herd was made up of both Holsteins and Jerseys.

Nine of these dairies were headed by purebred registered bulls, 10 in number, all of the Holstein breed.

Year round freshening of cows was the rule, to insure a continuous supply of milking cows.

Milking on every dairy was done at approximately 12-hour intervals, although a few dairymen began their afternoon milking an hour earlier than in the morning. One dairyman milked at 1 o'clock, 10 at 4 and 4:30, 6 at 5, and 2 at 6 o'clock. With but a single exception where a milking machine was consistently in use, all cows were milked by hand.

Nationalities of both operators and milkers were stated as American, Italian-Swiss, Swiss, Danish, Italian, Portuguese, and French.

Of the 19 dairies studied in this section, 16 specialized in the production and sale of whole milk, with the remaining 3 selling both

whole milk and butterfat. The latter 3 retailed their product; the others sold wholesale to F. M. Frazell Cheese Factory, Gilroy; Hollister Creamery; Watsonville Creamery; United Milk Company of San Francisco; Nestle's Food Company, Gonzales; and to the Salinas Valley Dairymen's Association.

The personnel of the operators on these 19 dairies consisted of 15 owners and 4 tenants.

Summary of Costs

In table 23 are set forth the condensed findings concerning the cost factors—kinds, amounts, and totals—entering into the production of whole milk and butterfat in this district.

TABLE 23

COST OF MILK PRODUCTION SUMMARY—MONTEREY, SAN BENITO, SANTA CRUZ COUNTIES

Number of dairies	19	
Number of cows	732	
Number of bulls	21	
Costs		
Operating		
Labor		
Man—manual, 101,674 hours	$30,352.88	
Man—management	6,120.00	
Horse, 9,259 hours	979.99	
Truck and automobile, 17,942 miles	1,046.27	
Insurance	202.10	
Total labor cost		$38,701.24
Feed		
Pasture	$11,182.10	
Hay, 3395 tons	51,156.00	
Concentrates, 47.46 tons	1,315.69	
Silage, 426⅔ tons	2,550.84	
Green feed, 845½ tons	3,491.87	
Roots, 55.2 tons	374.00	
Total feed costs		70,070.50
Hauling milk		2,465.56
Supplies, cow testing, etc.		1,887.46
Interest on operating capital, $7,990.00 @ 6%		479.40
Herd charge		
Interest on average investment in cattle, $75,314.48 @ 6%	$4,518.86	
Depreciation	387.07	
Mortality: 21 cows, $1,870; 1 bull, $250	2,120.00	
Taxes	1,068.35	
Total herd charge		8,094.28

Building charge			
Interest on average investment of $43,434.50 @ 6%		$2,606.07	
Depreciation		1,672.00	
Upkeep		761.17	
Taxes		292.25	
Insurance		227.90	
Total buildings charge			5,559.39
Corral charge			
Use of land, including taxes, 72 acres		$1,231.00	
Interest on investment in improvements, $6,780.50 @ 6%		406.83	
Depreciation of improvements		787.00	
Upkeep		189.00	
Total corral charge			2,613.83
Equipment charge			
Interest on average investment of $6,587.04 @ 6%		$395.14	
Depreciation		1,160.13	
Upkeep		521.18	
Taxes		19.16	
Total equipment charge			2,095.61
Total gross cost			$131,967.27
Credits			
Calves, 627	$3,866.85		
Manure	1,184.50		
Total credits	$5,051.35		
Net cost of whole milk			$126,915.92
Total production of whole milk			5,002,049 pounds
Cost per hundredweight of whole milk			$2.54
Total production of butterfat in whole milk			181,400.41 pounds
Cost per pound of butterfat in whole milk			70 cents
Average annual production per cow			6829 pounds of whole milk 248 pounds of butterfat

Comments on Cost Findings

The 19 herds concerned in the cost of milk production studies conducted in Monterey, San Benito, and Santa Cruz counties were assessed for $32,200. The buildings used in connection with these dairies were assessed for $8887.50. Dairy equipment was assessed for $620. Tax rates per $100 of assessed value varied from $2.70 to $4.93. Total taxes paid amounted to $1068.35 on cattle, $292.25 on dairy buildings, and $19.16 on dairy equipment.

Buildings and employer's liability were the only kinds of insurance carried in connection with the dairies. Fifteen of the 19 dairymen carried building insurance, and 7 carried employer's liability insurance.

Manual labor used in carrying on the work of these dairies cost an average of 30 cents an hour. Eighteen of the 19 dairymen estimated that their time spent wholly in management was worth a total of $6120, or 20 per cent of the amount expended for manual labor.

Eleven of these dairymen used horse labor in connection with the work of the dairies. The cost an hour, based on all work done by the work horses averaged 10.6 cents, although ranging from 5.7 to 27.6 cents.

Two trucks, two automobiles, and one tractor were used in carrying on the work of the dairy by as many dairymen. The cost a mile ranged from 3 to 10 cents, averaging close to 5 cents a mile.

The value of the pasturage used by 16 dairymen amounted to $17.12 a cow a year for the number of cows carried by the dairies having pasture. The costs per ton for other feeds used during the year that these dairies were under observation averaged for the year: Hay, $15.07; concentrates, $29.83; green feed, $4.13; silage, $6.00; and roots, $6.76.

Twelve of these dairymen had their product hauled under contract, paying $2465.56 for this service. In addition, purchase of supplies, payments for cow testing, and similar items totaled $1887.46, all dairymen reporting minor expenditures of this sort during the year. Operating capital amounted to $7990 or $420 per dairy.

The average investment in milking herds for the year amounted to $75,314.48, of which bull values made up $2,963.73, or close to 4 per cent, while the cows made up the balance. Cow values per head based on the different herd averages ranged from $60 to $150. All cows covered by the study averaged $94.48. Bull values ranged from $47.50 to $350, and averaged $141. Of the 21 bulls in the district, 14 were valued at $150 or less.

Cow values reflected an appreciation in 11 of these 19 dairies but the depreciation occurring in the remaining 8 herds was sufficient to more than offset these gains, so that a net depreciation for all herds took place, amounting to $67.07. Bull appreciation occurred on 5 dairies and bull depreciation on the remaining 14, the final figure showing a net depreciation of $320. Total herd depreciation amounted to $387.07.

Mortality of the milking herds, during the year covered by this study, amounted to 21 cows valued at $1870, and one bull valued at $250, or total losses of $2120. The average value of cows dying amounted to close to $80 a head, or nearly 85 per cent of the average of all cows in the herds.

Building equipment of these dairies consisted of 18 milking barns, 1 dairy having no barn, 13 milk houses, 11 feed, calf, and shelter sheds, and 8 silos. The investment in these structures varied from nothing to $4947, averaged $2391, and totaled $43,434.50. Eight dairies possessed an investment of from $2000 to $3000, six of from $1000 to $2000, four of more than $3000, and only the one having no equipment classified as having less than $1000 invested. Nine dairymen made expenditures for building upkeep, ranging from $5 to $410, and totaling $761.17. This amounted to an annual upkeep expense equivalent to 1.7 per cent of the investment in such equipment. Depreciation totaled $1672, or practically 4 per cent of the investment.

Land used for corrals and dairy structures amounted to 72 acres, the individual dairies utilizing from one to ten acres each. Use of this land was figured at $1231, or at the annual rate of $17.10 per acre. Investment in corral fences, watering facilities, and similar improvements ranged from $131.50 to $655.50, totaled $6780.50, and averaged $356.68 a dairy. Five dairymen spent various sums for upkeep of these improvements, varying from $10 to $103, and totaling $189. Upkeep expenditures are therefore equal to 2.8 per cent of the investment

Fig. 19.—Typical dairy building equipment and layouts of the Monterey, San Benito and Santa Cruz districts.

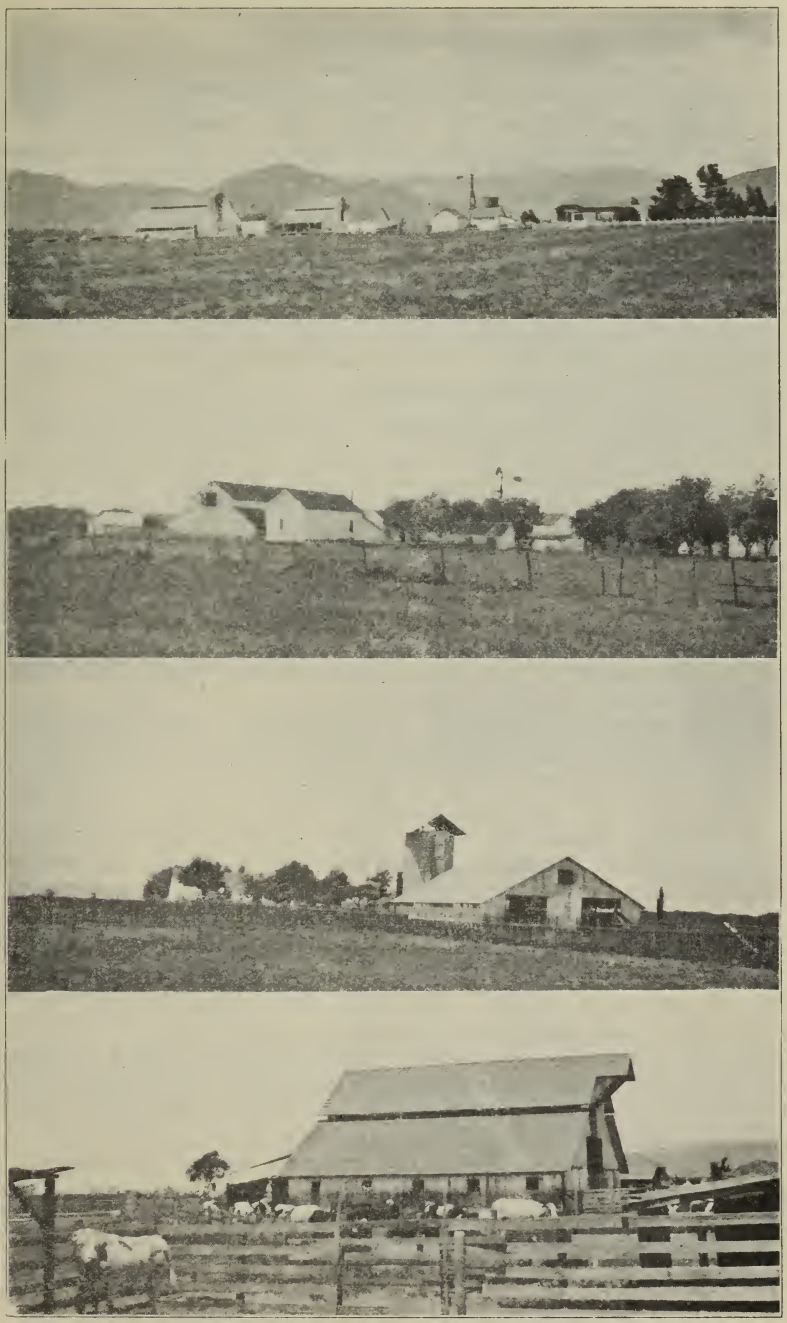

Fig. 19.—(*Continued.*)

in such improvements. Depreciation during the year amounted to $787, or 11.6 per cent of the amount of the investment.

Dairying equipment shown by the inventories of the various items required to carry on the work of the dairies consisted of 4 milking machines, 5 separators, 266 milk cans, 70 pails, 20 coolers, 4 sterilizing tanks, 8 washing vats, 12 wheelbarrows, 5 veterinary outfits, 7 lanterns, 19 shovels, 31 forks, 20 brushes, 20 brooms, 4 boilers, 1 manure cart, 3 manure scrapers, 1 feed mixing box, 1 corral scraper, 2 wagons, 1 sled, 4 strainers, 4 milk receiving vats, 1 clarifier, 3 coal oil burners and pressure tanks, and a miscellaneous assortment of hose. Investment in this equipment totaled $6587.04, averaged $346.79 per dairy, and ranged from $22.90 on the dairy having the least equipment to $1250.75 on the dairy having the most. During the year, all dairymen found it necessary to make expenditures for equipment upkeep, ranging from $4.40 to $75.30, and totaling $521.18. This amounted to about 8 per cent of the investment. Depreciation amounted to $1160.13, or 17.6 per cent of the investment.

Miscellaneous returns were unimportant. Sales of feed sacks to the amount of $1 and $5.35 worth of hides were the only items of this nature reported.

Credit for calves produced by the milking herd amounted to $3861.50, this sum being set as constituting the value of 627 calves saved for either vealing or rearing. The average value thus amounted to $6.15 per head. The lowest price reported was $2.50 a head, the highest $8.00.

No sales of manure produced by these dairies were recorded, but ranch use gave to the herds a credit for manure to the amount of $1184.50. This sum was the total reported by 12 dairymen, the others deeming the manure of no value to them. The total number of cows on the dairies of men assigning some value to the output of manure amounted to 485 head.

Of the 19 dairymen in this district, 3 sold both whole milk and butterfat as cream, while the others confined their sales to whole milk only. Total production, in terms of whole milk amounted to 5,002,049 pounds; in terms of butterfat, to 181,400.41 pounds. Of this production, 6.6 per cent was used at the dairy, and 93.4 per cent sold. Tests of the different dairies averaged from 3.4 to 4 per cent butterfat in milk, or a general average for the district during the year that these studies were under way of 3.6 per cent.

The average annual production for the 732 cows studied amounted to 6829 pounds of whole milk, or 248 pounds of butterfat per cow. The lowest herd average of the 19 dairies was 4438 pounds of whole milk per cow per year, containing 159 pounds of butterfat. The highest herd average amounted to 9641 pounds of whole milk containing 347 pounds of butterfat per cow. Of the 19 dairies, 9 were below the average whole milk yield per cow, while 4 were barely above the average. Nine were 15 pounds or more below the average butterfat yield of the total 19 dairies, while 5 averages of individual herds hovered close to the average butterfat yield for the district.

Since only 2 of these 19 dairymen sold cream, the data of prices received for this product are too scanty for averaging. Prices received for wholesale selling of whole milk averaged $1.98 per 100 pounds, which was equivalent to 55 cents per pound for the butterfat contained therein.

Costs of Production by Individual Dairies

In table 24 are set forth the various items entering into the cost of producing milk on each of the 19 dairies studied in Monterey, San Benito, and Santa Cruz counties. These are figured on an average per cow basis, for both cost items and production.

Dairies numbered 112 to 118 inclusive are in the Salinas Valley of Monterey County, dairies numbered 248 to 250 are likewise in Monterey County but classify more fittingly perhaps with the two dairies in Santa Cruz County, numbers 249 and 251, since these four are located in close proximity to each other. The dairies numbered 166 to 174 inclusive are in San Benito County.

The cost of producing whole milk on each of these dairies, as shown by the findings, ranges from a low of $1.56 to a high of $3.76 per 100 pounds, while butterfat costs varied from 43 cents to $1.04 per pound. Nine of the dairies produced their output at a figure at or less than the average cost for the 19.

TABLE 24

AVERAGE COST AND PRODUCTION PER COW FOR INDIVIDUAL DAIRIES IN THE MONTEREY–SAN BENITO–SANTA CRUZ DISTRICT

Dairy No.	Ave. of Dist.	112	113	114	115	116	118	166	167	168	169	171	171a	172	173	174	248	249	250	251
No. of cows	732	27	19	39	71	49	53	23	30	43	36	16	65	17	57	33	28	48	54	24
Cost items:	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Labor	52.83	51.75	82.74	49.85	50.70	57.20	29.43	76.03	50.50	41.59	63.14	103.97	52.74	83.64	46.11	53.57	44.66	53.62	44.43	55.44
Feed	95.66	100.38	122.26	132.32	77.47	83.12	56.06	89.95	57.87	83.74	104.16	114.58	97.85	128.81	105.49	132.20	99.96	99.81	100.90	96.70
Minor items	6.60	5.54	10.27	8.80	6.40	7.04	5.18	4.16	1.35	5.69	5.97	7.81	7.28	7.85	10.54	7.11	12.54	6.15	2.77	4.77
Herd charge	11.05	24.90	17.91	5.29	20.11	14.59	12.19	34.74	*23.19	17.44	19.35	13.37	6.61	*10.59	20.92	8.36	4.97	4.91	5.02	1.74
Building charge	7.59	.....	8.27	8.68	5.73	5.88	2.36	7.52	9.24	6.47	7.38	9.97	11.00	10.68	5.11	13.25	10.08	9.81	6.81	14.11
Corral charge	3.57	3.09	4.13	4.67	2.09	2.42	1.10	5.46	5.07	5.26	3.44	6.38	2.58	5.74	3.90	4.84	2.98	5.86	2.45	2.82
Equipment charge	2.86	1.22	3.83	3.46	3.07	5.28	1.28	.90	.51	10.06	3.15	2.27	1.05	2.39	1.49	3.31	1.31	4.55	1.23	2.71
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Total gross cost	180.16	186.88	249.41	213.07	165.57	175.53	107.60	218.76	124.54	170.25	206.59	258.35	179.11	239.11	193.56	222.64	176.50	184.71	163.61	178.29
Credits—Calf, hide, manure, herd	6.89	5.26	5.05	11.46	7.27	4.74	6.68	9.48	34.89	6.51	9.72	7.27	4.71	15.44	6.89	3.88	9.71	8.86	5.27	6.77
	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
Net cost of whole milk	173.27	181.62	244.36	201.61	158.30	170.79	100.92	209.28	89.65	163.74	196.87	251.08	174.40	223.67	186.76	218.76	166.79	175.85	158.34	171.52
Production of whole milk, pounds	6829	6865	8662	8554	6462	7421	6477	6179	5698	6968	6770	9641	6894	9074	8562	6858	4438	5161	6042	5102
Cost per hundredweight of whole milk	$2.54	$2.64	$2.82	$2.36	$2.45	$2.30	$1.56	$3.38	$1.57	$2.35	$2.91	$2.60	$2.53	$2.46	2.18	$3.19	$3.76	$3.41	$2.63	$3.36
Production of butterfat, pounds	248	244	310	306	231	284	233	211	194	244	223	347	253	317	326	247	159	206	217	194
Cost per pound of butterfat in whole milk, cents	70.0	74.0	79.0	66.0	68.0	60.0	43.0	99.0	46.0	67.0	88.0	72.0	69.0	70.0	57.0	88.0	104.0	85.0	73.0	88.0

* Credit.

PART III. UNIT FACTORS IN PRODUCING WHOLE MILK AND BUTTERFAT

From the various data presented in Part II, it is possible to work out certain of the unit factors involved in the production of whole milk or butterfat. By "unit factors" are meant the basic items making up the completed cost, and measured in terms of time and quantity whenever possible, rather than in dollars and cents. Such calculations provide a formula which will apply in future years so long as dairying practice remains the same. The principal purpose of this section, therefore, is to provide a working basis for future years, determined from the results of the investigations conducted in 1922, so that with the findings thus secured it will be possible to substitute new rates and thus determine costs for any future year. Such calculations and presentations tend to place in reasonably permanent form the work of a single year.

The unit factors set forth the amount of labor, feed, hauling, supplies, interest on operating capital, and charges for herd, buildings, corrals, and equipment reported in quantity, dollars, and percentages for a stated amount of product.

When dealing with unit factors entering into production costs, it is possible to consider hours and pounds as units of the labor and feed factors. But apparently the only satisfactory unit of measurement is the dollar when considering the factors of supplies, interest on operating capital, and herd, building and equipment charges. In figuring credits, the dollar, with the exception of the skimmilk credit, must likewise be made the unit.

In the following discussion of unit factors of production costs, "R" represents the going rate in dollars for the particular item during any year. "x" represents the purchasing power of the dollar as compared with 1922, the year of this survey. For example, "R" might represent a rate of 30 cents an hour for labor or $20 a ton for hay. The purchasing power of the dollar may increase to twice its 1922 value, in which case "x" would equal 2; or it might decrease to one-half its value during 1922, in which case "x" would equal one-half.

In the following section showing the method of determining the cost of producing 1000 pounds of whole milk and 100 pounds of butterfat, it will be noted that the designation is 1 over x, e.g., $\frac{1}{x}$,

instead of "*x*." The inverse ratio is used because this factor influences the known unit factors inversely. For example, if the dollar of tomorrow will buy twice the amount of supplies that it will today, its purchasing power is twice that of today, and the capital needed for the same amount of supplies is reduced to one-half. Therefore, the inverse ratio is always to be used.

The purchasing power of the dollar for any given year as compared with 1922, or "*x*" may be determined from current statistical business data published by bankers, business rating agencies, or similar sources.

In using this formula, based on factors entering into production costs, the application of the going rates during any year to the units herein set out will determine the production costs during that year so long as practices remain the same as in 1922.

Insurance on feed and workmen's compensation or accident insurance are not shown as unit factors. In supplying these data these items should be shown as part of the rate, i.e., if the rate for hay is $15 a ton and insurance amounts to 5 cents a ton, the rate to be used is $15.05. Accident insurance should be added to the manual labor charge, the amount being determined by the current rate per $100 of wages paid.

COST OF PRODUCING 1000 POUNDS OF WHOLE MILK AND 100 POUNDS OF BUTTERFAT

"*R*" represents the going rate for the particular item set opposite during any year.

"*x*" represents the purchasing power of the dollar during that year as compared with 1922. If the rate is the same, it is expressed by the figure "1"; if it is one-half the 1922 value, the figure is "½"; if, on the other hand, the new rate is twice the 1922 value, the "2" is used, etc.

** represents the unit factor for each item. Details are set forth, further on, under the discussion of the unit factors for each of the 11 districts.

Labor

Manual labor ** hours @ *R*.
Management ** per cent of manual labor.
Horse labor ** hours @ *R*.
Use of truck ** miles @ *R*.

Feeds

Pasture ** acres @ *R*.
Hay ** pounds @ *R*.
Concentrates ** pounds @ *R*.
Silage ** pounds @ *R*.
Miscellaneous feeds ** pounds @ *R*.

Miscellaneous

Hauling:

For butterfat, $100 \times R$ per pound.

For milk, $10 \times R$ per hundredweight.

Supplies: $\frac{1}{x} \times \$^{**}$.

Interest on operating capital: $\frac{1}{x} \times \$^{**}$.

Herd charge: $\frac{1}{x} \times \$^{**}$.

Building charge: $\frac{1}{x} \times \$^{**}$.

Corral charge: $\frac{1}{x} \times \$^{**}$.

Equipment charge: $\frac{1}{x} \times \$^{**}$.

The sum of the above items gives the total gross cost. From this, the following credits must be deducted:

Credits

Calf: $** \times R$.

Manure: $\frac{1}{x} \times \$^{**}$.

The difference between the sum of these two credits and the total gross cost is the cost of producing 1000 pounds of whole milk. To determine butterfat cost, a skimmilk credit must be added to the two credits noted above.

Skimmilk: ** @ *R*.

The sum of the three credits deducted from the total gross gives the cost of producing 100 pounds of butterfat.

Percentages of Different Items Entering into the Cost of Producing Whole Milk and Butterfat

An idea of the relative importance of the different items entering into the costs of producing whole milk and butterfat can be gained from the percentage of each entering into the gross costs. Table 25 gives in detail for each of the 11 districts where cost studies were conducted and for the dairies from which full and usable data were collected the percentage of each item making up the cost totals.

TABLE 25—Showing Percentages of Different Cost Items Entering into the Production of Whole Milk and Butterfat

Items	Districts										
	Humboldt-Del Norte	Marin-Sonoma	Alameda-Contra Costa-Santa Clara	Sacramento-Yolo	San Joaquin-Stanislaus	Fresno	Kern	Los Angeles-Orange	San Diego	San Luis Obispo	Monterey-San Benito-Santa Cruz
Labor	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Man—manual	22.1	20.4	22.5	24.1	22.3	23.0	24.9	17.4	20.0	28.4	23.2
Man—management	7.5	1.7	4.7	3.0	8.6	6.1	4.2	2.6	5.6	4.6	4.6
Horse	1.0	1.0	.9	.8	.6	.9	1.3	.8	.7	2.2	.7
Truck and automobile	.6	1.7	1.3	.7	.....	.....	.....	.1	.4	2.2	.8
Total labor	31.2	24.8	29.4	28.6	31.5	30.0	30.4	20.9	26.7	37.4	29.3
Feed											
Pasture	13.0	12.0	5.9	6.1	3.3	4.3	16.5	.8	2.9	10.3	8.5
Hay	21.9	18.9	20.1	27.3	28.5	30.7	29.9	27.2	19.9	25.8	38.8
Concentrates	9.4	20.5	12.9	4.2	6.2	6.9	2.1	14.4	17.2	5.8	1.0
Roots, pumpkins, etc	4.9	.5	.....	.1	.....	.....	.1	1.9	.....	.6	.3
Silage	.3	1.4	1.4	4.7	4.0	2.9	3.4	6.6	7.3	.....	1.9
Green feed	5.0	.....	5.0	4.8	.....	1.1	.....	5.5	4.5	.8	2.6
Miscellaneous	.....	.....	.2	.....	.....	.....	.....	.1	.....	.2	.....
Total feed	54.5	53.3	45.5	47.2	42.0	45.9	52.0	56.5	51.8	43.5	53.1
Hauling	1.9	.7	7.1	3.3	3.6	4.1	5.9	4.3	5.0	.....	1.9
Supplies, etc	1.9	2.9	2.2	2.1	3.0	2.0	3.0	2.4	3.7	2.0	1.4
Interest on operating capital	.4	.3	.4	.3	.3	.2	.2	.4	.1	.4	.4
Herd charge											
Interest	3.6	3.5	2.9	4.0	5.2	5.0	4.4	3.3	3.6	4.6	3.4
Depreciation	*−1.7	2.3	2.0	*− .5	*− .8	.3	*−8.6	5.7	*− .7	1.9	.3
Mortality	1.4	1.9	1.9	3.2	5.1	4.5	3.6	1.6	2.3	2.3	1.6
Taxes	.7	.7	.5	.6	.9	.7	.6	.6	.5	.7	.8
Insurance	.1	.....	.....	.....	.....	.....	.....	.1	.....	.....	.....
Total charge	4.1	8.4	7.3	7.3	10.4	10.5	0.0	11.3	5.7	9.5	6.1

* Herd appreciation.

TABLE 25—(*Concluded*)

Items	Districts										
	Humboldt-Del Norte	Marin-Sonoma	Alameda-Contra Costa-Santa Clara	Sacramento-Yolo	San Joaquin-Stanislaus	Fresno	Kern	Los Angeles-Orange	San Diego	San Luis Obispo	Monterey-San Benito-Santa Cruz
Buildings charge	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Interest	1.6	2.6	2.2	2.6	2.5	1.4	1.7	.9	1.4	2.3	2.0
Depreciation	.8	1.7	1.5	2.1	1.7	1.3	.6	.9	1.2	1.0	1.2
Upkeep	.2	.8	.3	1.6	.4	.4	1.3	.2	.4	.4	.6
Taxes	.2	.4	.2	.4	.4	.2	.2	.2	.1	.2	.2
Insurance	.2	.1	.1	.4	.2	.1	.1	.1	.1	.1	.2
Total charge	3.0	5.6	4.3	7.1	5.2	3.4	3.9	2.3	3.2	4.0	4.2
Corral charge											
Use of land	.4	.1	.6	.8	.8	.3	.6	.5	.2	.1	1.0
Interest on improvements	.2	.2	.4	.6	.5	.3	.6	.2	.3	.4	.3
Depreciation	.3	.3	.5	.9	.8	.2	.5	.3	.6	.3	.6
Upkeep	.1	.1	.....	.2	.....	.1	.5	.1	.....	.....	.1
Total charge	1.0	.7	1.5	2.5	2.1	.9	2.2	1.1	1.1	.8	2.0
Equipment charge											
Interest	.3	.6	.3	.2	.4	.4	.4	.1	.4	.7	.3
Depreciation	1.0	2.2	1.4	.5	1.2	2.1	1.3	.4	1.3	1.2	.9
Upkeep	.7	.4	.6	.8	.3	.5	.7	.3	1.0	.5	.4
Taxes	.....	.1	.....	.1	.....	.....	.....	.....	.....	.....	.....
Insurance	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total charge	2.0	3.3	2.3	1.6	1.9	3.0	2.4	.8	2.7	2.4	1.6
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Herd appreciation.

UNIT FACTORS ENTERING INTO THE PRODUCTION OF WHOLE MILK AND BUTTERFAT

In tables 26, 27, and 28 immediately following are set forth data showing the amount of labor, feed, and other items entering into the production of 1000 pounds of whole milk or 100 pounds of butterfat. The findings for each district are presented individually. In every case, data from all the dairies studied in a given district, as appearing in Part II of this report, were used in determining the figures of unit factors. The basic data is in accordance with conditions encountered during the year 1922.

Since the rates of the year that these studies were made are already set forth in Part II, no further reference to them appears necessary in connection with the unit factors. Unit factors in terms of time and quantity, whenever such can be determined, are of more lasting value and interest than are the rates which may hold for but limited periods.

The items manual labor, horse labor, use of trucks and automobiles, feeds, management, hauling, supplies, interest on operating capital, herd charge, buildings charge, corrals charge, equipment charge, comprise the total gross charge, from which is then deducted the total of credits to give the net cost.

COST OF PRODUCTION FIGURES IN RELATION TO PRICE-FIXING

H. E. Erdman, Associate Professor of Rural Institutions, College of Agriculture, in discussing some of the possibilities as well as some of the limitations in the use of unit cost data and formulae in connection with price-fixing, sounds a warning. He says:

> The idea has naturally been put forth that price changes might be made in accordance with changes in the costs of producing milk as indicated by the application of current prices to these unit factors. This idea was advanced in several parts of the country during and immediately following the war. The dairymen in the New York and Chicago milk-producing areas particularly had data of this sort at hand, and naturally attempted to establish prices of whole milk on the basis of cost changes so shown.
>
> On the face of it, this plan should have worked; but trouble arose at once when it was attempted to establish prices from month to month on this basis. Market prices of whole milk over any short period are governed more directly by the supply of and demand for whole milk and by the market prices of such products as butter, cheese and condensed milk, than by costs of production. Furthermore, prices of butter and cheese in the main are established outside of whole milk market districts, and the prices of all three are very directly affected by foreign competition. It was found that at certain times milk simply could not be sold on the basis of costs thus computed, for an increase in the price of milk almost invariably resulted in decreased consumption. The attempt thus to establish prices was therefore soon given up.
>
> Such data are valuable, however, to provide starting-points in the discussion of milk price changes whether on the part of producers demanding increases or of consumers or dealers demanding decreases, for they reflect fairly accurately any important changes in costs of production so long as methods of production remain unchanged in the localities in question.

TABLE 26—Unit Factors Involved in the Production of 1000 Pounds of Whole Milk

District	Items Making Up Gross Cost																	Credits	
				Feeds															
	Manual labor, hours	Horse labor, hours	Use of trucks or automobiles, miles	Pasture	Hay, pounds	Concentrates, pounds	Silage, pounds	Green feed, pounds	Roots and tubers, pounds	Miscellaneous, pounds	Management—Per cent of manual labor	Hauling	Supplies	Interest on operating capital	Herd charge	Buildings charge	Corrals charge	Equipment charge	Calf	Manure
Humboldt-Del Norte	24.3	1.4	1.9	$3.51	496	127	24	662	1342		34%	Current rate	$0.50	$0.10	$1.10	$0.80	$0.26	$0.53	6/100 of value of one calf	$0.59
Alameda-Contra Costa-Santa Clara	17.1	3.4	4.8	1.74	818	271	170	960		31	21	Current rate	.64	.12	2.16	1.28	.45	.68	9/100 of value of one calf	.59
Yolo-Sacramento	19.1	2.3	2.4	1.59	1020	70	414	726	22	3	12.5	Current rate	.53	.08	1.89	1.83	.65	.42	13/100 of value of one calf	.38
San Joaquin-Stanislaus	20.1	2.1	.1	.94	1330	134	377			3.6	38.7	Current rate	.85	.08	2.93	1.47	.59	.55	13/100 of value of one calf	.64
Fresno	18.6	2.3	0	1.09	1128	103	219	170			26.6	Current rate	.50	.04	2.56	.86	.23	.74	12/100 of value of one calf	.52
Kern	20.3	2.9	0	3.86	1068	39	252		7		16.8	Current rate	.69	.54	0	.90	.51	.57	12/100 of value of one calf	.73
Los Angeles-Orange	18.7	3.0	1.0	.33	954	314	694	678		300*	15.0	Current rate	.92	.17	4.54	.90	.44	.30	8/100 of value of one calf	1.60
San Diego	23.5	1.4	1.6	1.13	729	321	740	553			28.	Current rate	1.46	.21	2.26	1.26	.45	1.08	12/100 of value of one calf	1.53
Monterey-San Benito-Santa Cruz	20.2	1.9	3.6	2.23	1356	19	170	338	22		20.1	Current rate	.38	.10	1.62	1.11	.52	.42	13/100 of value of one calf	.24

* Pumpkins and squash, 270 pounds; bean straw, 30 pounds.

TABLE 27

Unit Factors Involved in the Production of 100 Pounds of Butterfat

Districts	Items Making Up Gross Cost																	Credits		
				Feeds																
	Manual labor, hours	Horse labor, hours	Use of trucks or automobiles, miles	Pasture	Hay, pounds	Concentrates, pounds	Silage, pounds	Green feed, pounds	Roots and tubers, pounds	Miscellaneous, pounds	Management—Per cent of manual labor	Hauling	Supplies	Interest on operating capital	Herd charge	Buildings charge	Corrals charge	Equipment charge	Calf	Manure	Skimmilk, pounds
Marin-Sonoma	47.7	3.5	7.5	2.53 acres	1340	700	220				8.4	Current rate	$1.64	$0.18	$4.72	$3.14	$0.38	$1.84	36/100 of value of one calf	$0.73	1992
Yolo-Sacramento	56.1	6.5	6.7	$4.55	2920	206	1190	2080	64	9	12.5	Current rate	1.53	.23	5.41	5.26	1.87	1.20	38/100 of value of one calf	1.09	2610
San Joaquin-Stanislaus	50.1	5.2	.2	2.34	3310	332	936			9	38.7	Current rate	2.11	.19	7.27	3.66	1.47	1.36	31/100 of value of one calf	1.59	2235
Fresno	53.2	6.5	0	3.12	3220	293	628	484			26.6	Current rate	1.43	.12	7.33	2.46	.65	2.12	34/100 of value of one calf	1 47	2595
Kern	51.9	7.4	0	$9.88	2735	99	647		18.6		16.8	Current rate	1.78	1.38	.01	2.32	1.30	1.43	31/100 of value of one calf	1.87	2310
San Luis Obispo	72.8	5.9	12.7	3.07 acres	2110	208		181	140*	19	16.2	Current rate	1.23	.22	5.80	2.43	.49	1.49	54/100 of value of one calf	21	2380

* Pumpkins and squash.

TABLE 28

UNIT FACTORS INVOLVED IN THE PRODUCTION OF 100 POUNDS OF BUTTERFAT IN WHOLE MILK

DISTRICT	ITEMS MAKING UP GROSS COST																	CREDITS	
				FEEDS															
	Manual labor, hours	Horse labor, hours	Use of trucks or automobiles, miles	Pasture	Hay, pounds	Concentrates, pounds	Silage, pounds	Green feed, pounds	Roots and tubers, pounds	Miscellaneous, pounds	Management—Per cent of manual labor	Hauling	Supplies	Interest on operating capital	Herd charge	Buildings charge	Corrals charge	Equipment charge	Calf	Manure
Humboldt-Del Norte	55.7	3.1	4.3	$8.05	1138	292	52	1520	3086		34.0	Current rate	$1.15	$0.22	$2.54	$1.84	$0.59	$1.22	14/100 of value of one calf	$1.35
Los Angeles-Orange	48.5	7.7	2.7	.87	2480	818	1804	1762		780*	15.0	Current rate	2.40	.44	11.53	2.33	1.13	.78	22/100 of value of one calf	4.17
San Diego	54.6	3.4	3.7	2.63	1698	747	1721	1328			28.0	Current rate	3.39	.48	5.26	2.99	1.05	2.50	28/100 of value of one calf	3.55
Monterey-San Benito-Santa Cruz	56.0	5.1	9.9	6.13	3740	52	470	930	61		20.1	Current rate	1.04	.26	4.46	3.06	1.44	1.15	35/100 of value of one calf	.65

* Pumpkins and squash, 700 pounds; bean straw, 80 pounds.

PART IV. WAYS FOR INCREASING DAIRY PROFITS DISCLOSED BY STUDYING COSTS OF PRODUCTION

Certain suggestive ways for increasing profits from dairying operations have developed during the course of this year-and-a-half study of the costs of producing milk on dairies in 11 important commercial dairying sections of the state, located in 21 counties. It is the plan to set forth here some of the more outstanding of these in the hope that individual dairymen may thereby perceive opportunities for benefiting themselves through instituting economies, curtailing leaks, or otherwise reorganizing their business on a more profitable basis.

The individual dairy farmer can perhaps do but little toward actually determining the prices that he will receive for his product. He can, however, do much in regulating his own business. That a good deal of improvement is possible along the line of greater economy is an interesting and important outcome of these investigations. While no attempt is here made to cover all things which can be done by the individual, enough are set forth to show something of the situation and to start thinking dairymen along this line of endeavor.

RELATION OF PRODUCTION COSTS TO PRICE

A discussion of whether or not prices should be raised or lowered is not particularly pertinent to this publication but attention may well be called to the fact that in all the districts studied there are a number of dairies selling their output at a price below the cost of producing. For purposes of illustration two districts have been selected for tabulation, one specializing in the sale of butterfat, the Marin–Sonoma section, the other of whole milk, the Alameda–Contra Costa–Santa Clara area. Cost data for the dairies in each group are set forth in two tables in order of costs, together with the percentage of total production contributed by each. This is done in such a way that one can tell at a glance what amount of the milk production of these dairies would be curtailed if the output had been stopped when average price received and cost average came into balance. Though the data are drawn from a single year and hence may be subject to future changes in operating costs, overhead charges, or prices received thus altering the point where costs and prices come into balance, yet they are instructive and possess a marked suggestive value. Further-

more, the idea can well be extended to the study of the entire output of a given community in order to determine whether or not there is over-production and thus whether the business should be curtailed or a wider market sought. From the dairymen's standpoint it serves to emphasize his need of knowing just what his business is doing so that if his activities are placing him on the wrong side of the balance line he may take steps to improve conditions. As the dairies on which the studies were conducted are typical of the many in any of the districts under observation, the situation shown in the table holds for all.

The manner of presenting, as herein set forth, is sometimes referred to as the "bulkline" method of comparing costs and prices, and is of value in showing the point which prices should reach to insure a satisfactory supply of any given commodity within the limits of current costs.

TABLE 29

Showing the Percentage of Production Above, Below, and on a Line with Average Costs and Average Receipts. Data from Nineteen Dairies Producing Butterfat, Marin and Sonoma Counties

Number of dairy	Cost of producing a pound of butterfat	Percentage of total production contributed	Accumulative percentages	Point of average costs and receipts
	Cents			
259	35.6	10.6	10.6	
258	38.0	4.1	14.7	
268	39.0	5.1	19.8	
261	39.0	4.6	24.4	
263	39.0	6.2	30.6	
103	41.0	7.3	37.9	Averaged price received 43.8 cents
274	44.5	3.1	41.0	
264	46.0	7.5	48.5	
260	47.0	4.3	52.8	Average cost 49.2 cents
262	49.5	3.4	56.2	
275	52.5	11.7	67.9	
281	53.0	5.7	73.6	
265	53.0	3.8	77.4	
278	58.0	4.2	81.6	
104	60.5	4.2	85.8	
98a	62.5	4.6	90.4	
257	70.0	4.5	94.9	
95	74.0	2.8	97.7	
102	82.0	2.3	100.0	

From these data it is evident that of the total output from these dairies 41 per cent was produced at a cost equal to or below the average price received during the year. Men able to sell at an equal price broke even, men producing at a cost below the selling price obviously made a profit. On the other hand dairymen whose costs were more than the selling price received produced at a loss. It is significant that more than half of the production from this small group of dairies was sold at less than cost, cost being considered as figured after the manner shown in the summary tables of Part II. In numbers this means that but seven of the 19 dairymen in this group produced at a cost equal to or less than the selling price. In a similar way the findings for a whole milk district—the Alameda, Contra Costa, and Santa Clara section—are presented in detail in table 30.

TABLE 30

SHOWING THE PERCENTAGE OF PRODUCTION ABOVE, BELOW, AND ON A LINE WITH AVERAGE COSTS AND AVERAGE RECEIPTS. DATA FROM TWENTY DAIRIES IN THE ALAMEDA, CONTRA COSTA, AND SANTA CLARA DISTRICT

Number of of dairy	Cost of production per 100 pounds of whole milk	Proportion of output	Cumulative output	Point of average costs and receipts
9	$2.13	.8	.8	
14	2.19	6.4	7.2	
7	2.44	.6	7.8	
230	2.45	10.2	18.0	Average price received
6	2.51	12.	30.0	$2.50
2	2.55	6.1	36.1	
226A	2.63	7.5	43.6	
228	2.69	6.2	49.8	
227	2.72	1.2	51.0	
13	2.76	2.6	53.6	
4	2.79	2.0	55.6	Average cost $2.83
3	2.86	10.2	65.8	
21	2.88	4.1	69.9	
23	3.24	10.0	79.9	
229	3.26	5.4	85.3	
16	3.33	6.6	91.9	
10	3.43	2.8	94.7	
12	3.44	1.9	96.6	
17	3.54	1.9	98.5	
18	4.31	1.5	100.0	

Table 30 indicates the situation with respect to dairymen whose costs were studied in Alameda, Contra Costa, and Santa Clara counties. Of the 20 dairies only 30 per cent of the total production was secured for costs at or below the average price received by them of $2.50 per 100 pounds. This means that 70 per cent of the supply from this group was produced at a loss.

From tables made up for all the dairies in the other districts where costs of producing whole milk and butterfat were studied, similar deductions were made. The findings are set forth in the following paragraphs.

In the Arcata district of Humboldt County none of the output was produced at a cost within the price received for the product, when sold either as butterfat or as whole milk. In the Orick-Requa district 2 dairymen of the 12 from whom records were obtained produced both butterfat and whole milk at a cost less than the price received for the output. Their production amounted to 13.4 per cent of the butterfat and 15.3 per cent of the whole milk totals produced by all the dairymen in the district from whom data were secured.

Butterfat costs in the Sacramento-Yolo district were such that, of the dairymen reporting costs in this study, only two, producing but a little more than 8 per cent of the output of the group, received a price equal to or less than their costs of production. The situation in connection with the production of whole milk was more favorable, practically 24 per cent being produced at costs not exceeding the price received, yet 76 per cent even in whole milk production cost more than the price received. Twenty-nine of the 41 dairymen produced whole milk at a loss.

In the San Joaquin-Stanislaus district, 5 of the 17 dairies where cost data were collected produced their butterfat at costs equal to or below the price received. Their combined production was 44 per cent of the total yields recorded for the group. Thus, over half the output of these dairymen went on the market at less than cost of production.

Seven of the 17 dairymen in the Fresno County district produced butterfat at a cost equal to or below the price received during the year. Their combined production amounted to 50.8 per cent of the production of all the dairymen in the group where cost data were collected. Figured on a whole milk basis, 8 dairymen were able to show costs either equal to or below the price received, their total output being 55.6 per cent of that of the entire group.

In Kern County, 7 of the 15 dairymen from whom cost data were obtained were able to produce butterfat at a cost equal to or below the average price received. Total production of these 7 amounted to 70 per cent of the total for the group. On a whole milk basis, 9 produced at or below the selling price, their combined output being 74 per cent of the total.

In the Los Angeles-Orange district, 17 of the 40 dairymen included in the study conducted in this section produced whole milk at a cost equal to or below the average price per pound of butterfat content paid for whole milk. Their combined production was but 34.1 per cent of the total output of the group studied. This left a total of 65.9 per cent selling at less than the cost of production.

Figured on a whole milk basis, 6 of the 13 San Diego County dairymen whose costs were studied were able to produce at a cost equal to or below the average price received during the year. The combined output of these men amounted to 62.2 per cent of the total for the group. Figured as butterfat, only 4 men produced at a cost about equal to or below the average price received, their production being 38.5 per cent of the total for the group.

Six of the 20 San Luis Obispo dairymen who coöperated in this study produced butterfat at a cost equal to or below the price received. Their combined output amounted to nearly 40 per cent of the total. Fourteen dairymen producing 60 per cent of the output therefore faced costs greater than the price they received.

In Monterey, San Benito, and Santa Cruz counties most of the dairymen whose dairies were studied also sold at a price below the cost of production. Of the 19 dairymen, all but two lost money when their output was figured on a butterfat basis, these two producing but a little more than 10 per cent of the combined output of the dairymen of this group. Similarly but two dairymen received a price for their output, when figured on a whole milk basis, equal to or more than their costs of production, and their output constituted but a little more than 10 per cent of the total for the group.

In reviewing the situation as set forth above, some allowance must necessarily be made for certain uneconomical and inefficient practices for which dairymen are responsible. Obviously, in determining a price that the consumer should be called upon to pay, it is necessary that dairying be placed upon a basis of efficiency so that labor is used to the best advantage, economy in feeding is practiced, and profitless cows are eliminated. In brief, proper handling of the dairy, intelligent management, and conservatism in making investments in cattle, buildings, and equipment must go hand in hand.

These tables show that in radically different dairying sections, different in average costs, average yields, methods of handling average receipts, and kinds of products, there are dairies producing at a loss. Such data emphasize the need for both community interest in the dairying business and for individual inquiry on the part of the dairymen as to what means can be taken on the dairy to help the situation.

ECONOMIZING IN LABOR AND FEED

Of the many factors entering into the cost of producing whole milk and butterfat the two outstanding items are labor and feed. Economy in operating expenses will therefore pay greatest returns when directed toward saving in these expenditures.

The importance of feed and labor in the cost totals is shown in table 31.

The table indicates that labor and feed ranged from 73.5 per cent of the total gross cost in one district to 85.7 per cent in another. Labor alone ranged from 20.9 per cent to 37.4 per cent of the total gross cost and feed alone from 42 per cent to 56 per cent. Because these two items make up such a large part of the total costs, attention may well be given to their efficient use and management.

Buying in bulk and when prices are low are obvious factors for economy. In feeding, care should be exercised to prevent waste. The use of properly designed feed racks makes for a saving of hay. At

TABLE 31

SHOWING PERCENTAGES OF LABOR AND FEED ENTERING INTO MILK PRODUCTION COSTS

District	Percentage of gross cost		Percentage total of labor and feed
	Labor	Feed	
	Per cent	Per cent	Per cent
Humboldt-Del Norte	31.2	54.5	85.7
Marin-Sonoma	24.8	53.3	78.1
Contra-Costa-Alameda-Santa Clara	29.4	45.5	74.9
Sacramento-Yolo	28.6	47.2	75.8
San Joaquin-Stanislaus	31.5	42.0	73.5
Fresno	30.0	45.9	75.9
Kern	30.4	52.0	82.4
Los Angeles-Orange-San Bernardino	20.9	56.5	77.4
San Diego	26.7	51.8	78.5
San Luis Obispo	37.4	43.5	80.9
Monterey-San Benito-Santa Cruz	29.3	53.1	82.4

times, the prices of certain kinds of hay or mill feeds mount very high. Then substitution should be made of other less expensive feeds from which the same, or practically the same, results can be obtained. In utilizing concentrates, the cow herself should possess a capacity to make full and economic use of these higher priced feeds, and conversely cows possessing such capacity should be fed to fully develop their inherent productive capacity. Feeding a cow beyond her capacity results in waste; on the other hand, the quantity of feed supplied each cow should not be below the quantity she requires for the most efficient production. The most economical use of feeds comes through careful buying, careful feeding, and utilization of knowledge concerning the production of each individual animal.

Variation in Feed Costs of Different Dairies

To illustrate the range in feed costs per 100 pounds of whole milk or per pound of butterfat, the costs by individual dairies in three districts operating under different conditions are shown in table 32.

TABLE 32

SHOWING VARIATION IN FEED COST PER 100 POUNDS OF MILK OR 1 POUND OF BUTTERFAT

Alameda-Contra Costa-Santa Clara		Kern		Los Angeles and Orange	
Dairy number	Cost of feed a 100 pounds of milk	Dairy number	Cost of feed a pound of butterfat	Dairy number	Cost of feed a 100 pounds of milk
			Cents		
14	$ .906	75	19.4	403	$1.63
9	.957	67	21.4	353	1.73
21	.974	76	23.6	129	1.81
6	.990	57	24.9	363	1.81
7	1.027	72	25.8	83	1.82
20	1.069	63	26.0	131	1.83
13	1.113	59	30.5	126	1.91
2	1.128	71	33.9	358	1.93
10	1.235	58	34.0	141	1.94
226A	1.275	62	34.0	93	1.95
223	1.434	56	35.0	91	1.99
4	1.481	66	37.2	366	2.03
227	1.485	61	38.8	90	2.08
3	1.550	65	52.7	352	2.09
12	1.628	60	56.4	138	2.11
16	1.635			89	2.11
17	1.680			92	2.15
23	1.695			402	2.18
18	1.922			143	2.20
29	1.942			82	2.20
				123	2.21
				401	2.21
				364	2.25
				365	2.25
				359	2.29
				136	2.33
				361	2.38
				355	2.38
				142	2.40
				404	2.47
				362	2.51
				367	2.55
				356	2.60
				137	2.64
				124	2.65
				125	2.66
				360	2.70
				140	2.72
				400	2.73
				134	2.91
Average	$1.340	Average	31.1	Average	$2.23

This table shows that in the Alameda–Contra Costa–Santa Clara district the average cost of feed per 100 pounds of milk ranged from a low of 90.6 cents to a high of $1.94 with an average of $1.34. The lowest figure in the data for this district is traceable to a high production per cow and the use of cheap hay, the next two lowest costs to use of pasture. The highest figure is largely due to a price for hay somewhat higher than the district average and the next few highest largely to a production somewhat below the average.

For the production of one pound of butterfat in the Kern district, the feed cost ranged from 19.4 cents to 56.4 cents, with an average of 31.1 cents for the 15 dairies. As far as could be ascertained, the low cost of feed was due to an abundance of pasture for a longer period than was available to the average dairy in the district, and the greater proportion of this pasture to hay fed than with most of the dairies. In one case of high feed cost, low production was probably responsible. In the two cases of highest feed cost, the amount of hay reported was excessive or else there was great waste in feeding.

The feed charge in the Los Angeles-Orange district ranged from $1.63 to $2.91 per 100 pounds of milk with an average of $2.23 for the 40 dairies. Low feed cost was accomplished very largely through high production, while in the cases of high feed costs there was an unnecessary waste in hay, too much being used, or else the production was low.

Variation in Labor Costs of Different Dairies

The variation in labor costs per 100 pounds of whole milk or per pound of butterfat on individual dairies is illustrated in table 33.

According to the data presented in table 33, the range in labor cost per 100 pounds of milk in the Alameda-Contra Costa-Santa Clara district was from a low of 40 cents to a high of 90 cents, with an average of 66 cents. The three dairies reporting the lowest labor costs used milking machines, to the use of which, at least in part, can be attributed the low labor charge. The high figure can be attributed to low production in part; the next high figure to higher wages than were ordinarily paid in the district; and the third high figure again to low production. The costs of labor on the fifteen dairies in Kern County ranged from 9.5 cents to 31.3 cents a pound of butterfat, with an average of 14.9 cents. The dairy with the lowest labor costs evidently increased the efficiency of the labor by the use of a milking machine. Other cases of low labor costs were noted where the operator and family did all the work and reported family wages at a lower

rate than was ordinarily given. Where the cost of labor was high, it was invariably found that the average production per cow of these dairies was low.

TABLE 33

SHOWING VARIATION IN COST OF MANUAL LABOR PER UNIT OF PRODUCTION IN THREE DISTRICTS

Alameda-Contra Costa-Santa Clara		Kern		Los Angeles and Orange	
Dairy number	Cost of labor a 100 pounds of milk	Dairy number	Cost of labor a pound of butterfat	Dairy number	Cost of labor a 100 pounds of milk
230	$ .408	72	$ .095	366	$ .407
229	.436	75	.119	401	.428
23	.578	62	.122	93	.458
14	.611	57	.131	402	.477
226A	.622	58	.134	403	.487
3	.656	76	.139	82	.552
2	.672	67	.141	355	.573
4	.672	63	.142	361	.574
228	.673	65	.144	404	.579
10	.692	71	.149	353	.581
9	.695	59	.156	356	.585
13	.740	60	.161	143	.587
16	.741	66	.204	400	.615
227	.744	56	.237	363	.632
21	.758	61	.313	352	.635
7	.762			359	.638
12	.787			365	.644
18	.825			140	.658
6	.895			91	.693
17	.902			124	.722
				358	.726
				131	.733
				126	.742
				367	.748
				141	.767
				90	.767
				129	.768
				137	.777
				92	.778
				123	.792
				360	.813
				83	.823
				362	.830
				134	.887
				125	.928
				142	.940
				136	.942
				89	.987
				138	1.027
				364	1.032
Average	$ .658	Average	$ .149	Average	$ .680

In the Los Angeles-Orange district, the labor charge ranged from 41 cents to $1.03 per 100 pounds of milk, with an average of 68 cents. High production per cow was the chief reason for low labor costs. More milkers in number than the average for similar sized herds resulted in high labor charges, even though high production prevailed on these dairies.

The size of the herd is an important factor in the efficient use of labor, that is, the size of the herd should be in multiples of the number that one man can economically and satisfactorily care for. Herds of odd numbers cause more or less loss of time.

Proper arrangement of buildings and corrals, such as proximity of the granary to the feeding barn or the milk house to the milking barn saves time. The use of labor saving machinery is another factor of importance. However, it is possible for the operating and overhead costs of such machinery to more than offset the saving in manual labor.

Properly planning the dairy work is another factor in economical use of labor. This implies a carefully worked out schedule and daily routine for both the operator and his men.

Greater efficiency in the use of labor may also be brought about by increasing production and applying most labor to those cows which will respond and less labor to those that do not justify such expenditures.

ELIMINATING BOARDER COWS

From the data presented in the preceding tables, it is possible to find the point in the amount of production, to fall below which means a loss for every cow thus failing to measure up to the standard. The desirability of properly testing cows for production and of disposing of unprofitable animals is amply shown by these findings.

Table 34 shows the amount of production required under 1922 conditions of breeding, feeding, handling, costs, and prices. If a cow in a given district is to pay for her keep, she must produce an amount equal to the figures set forth in this table for that district. Cows producing less are maintained at a loss if lacking in inherent possibilities of greater production, or if economies cannot be practiced to reduce costs. Of course, if higher prices are obtained from sales, or if cheaper feeds or labor are secured, or a saving in other items of cost brought about, the required production per cow necessary to break even will be lowered. But, conversely, a lower price for products or increased costs will raise the standard of production which the individual cow will be called upon to make if she is to be profit-

able. Knowledge of what one's cows are doing as individuals is a substantial aid in reorganizing the business for greater profits. In this connection it may be added that some dairymen deem it wise to retain temporarily some poor animals in order to utilize feed and labor that otherwise would go to waste, so that some returns are forthcoming pending ultimate weeding out of the poorer individuals.

The actual average production per cow as worked out in these studies is also shown in table 34.

TABLE 34

PRODUCTION PER COW NECESSARY TO MEET ALL ITEMS OF AVERAGE COSTS

District	Required production per cow per year		Actual production per cow in 1922 as shown by studies	
	Whole milk—pounds	Butterfat—pounds	Whole milk—pounds	Butterfat—pounds
Humboldt-Del Norte				
Arcata	7950	369	6184	267
Orick-Requa	6850	333	5618	249
Marin-Sonoma		243		216
Contra Costa-Alameda-Santa Clara	8100 or 942 gals.		7180 or 835 gals.	
Sacramento-Yolo	7550	328	6614	230
San Joaquin-Stanislaus		351		270
Fresno	6985	298	6793	238
Kern	5123	233	5993	234
Los Angeles-Orange-San Bernardino	8560	328	8041	309
San Diego	6445	285	6225	267
San Luis Obispo		185		161
Monterey-San Benito-Santa Cruz	8750	315	6829	248

In many cases, it can be shown that the high labor cost and the high feed cost on many dairies are directly traceable to low production per cow.

Closely correlated with the elimination of boarder cows is the desirability of breeding up the productive capacity of the present herds. Saving of calves from cows known to be good producers is sometimes practiced. With this may well go more attention to the keeping and using of better bulls on dairies where the raising of young stock to replace aging cows or to increase the size of the herd is both economically practical and in line with the inclinations of the operator.

In collecting data from most of the districts, the number of pure-bred and registered bulls was recorded. It is perhaps pertinent at this point to recapitulate the findings.

Of the grand total of 13,667 cows and 371 bulls in the 233 herds in the 10 districts where such data were collected, there were reported but 528 purebred cows and 207 purebred bulls. This is equivalent to slightly less than 4 per cent of purebred cows and 56 per cent of purebred bulls in use.

On some dairies, particularly in centers where whole milk production is the rule and limited quarters for dairying and lack of pasture for young stock largely precludes the raising of heifers, common bulls may be justifiable because of reduced investment and small depreciation. In fact, where all calves are to be vealed, the use of a beef breed rather than a dairy breed bull may actually help to increase profits. On the other hand, though, good management suggests the use of good dairy breed bulls, the saving of promising calves, and their proper rearing wherever feed conditions permit.

PROFITABLENESS OF VEALING CALVES

From a study of feed costs involved in raising calves it is evident that increased profits can be obtained by giving attention to the value of milk fed to calves and the length of time calves are kept on whole milk. Although this is a phase which concerns production of young stock rather than production of milk, the opportunity for increasing profits is such that attention may well be called to its possibilities. It is a matter to be worked out by each dairyman for himself, but it is not a difficult task to compute the amounts of milk fed, both whole and skim, determine the value of this milk, and compare the figure with the value of the calf at weaning or vealing age. On some dairies, killing of calves when dropped will be found justifiable. On other dairies, the raising of heifer calves for ultimately placing in the milking herd, or of young stock having a high breed value, is fully justified. Proper feeding is, of course, essential, and economy in cost should not be sought at the expense of correct feeding principles.

Data are presented below illustrating this point, based on the 1922 costs, manner of feeding as reported by dairymen, and with all items other than feed, such as labor, use of buildings and corrals, ignored. For purposes of comparison, four districts are discussed. These are Marin-Sonoma, San Luis Obispo, Fresno, and Monterey-San Benito-Santa Cruz.

In the Marin-Sonoma district, the general practice was found to consist in feeding calves to be kept for veal for periods of from three to four weeks. During this time, each calf consumed an average of 42 gallons of whole milk, containing 14.5 pounds of butterfat, which,

at prevailing market price, was worth $6.35. The average selling price per calf amounted to $10.22, so that the average net returns per calf amounted to $3.87 more than the cost of the milk. Out of this would still be deducted labor, use of equipment, and similar items, if net profit were to be determined.

In San Luis Obispo County, calves saved for ultimate vealing are permitted to run with their dams until three or four weeks old, when they are sold. Based on the average production per cow for the dairies under observation, it was possible to figure the amount of marketable milk used by the calves which otherwise could have been sold. It amounted to 38 gallons of whole milk containing 12.3 pounds of butterfat, which at the prevailing market rates had a value of $5.73. The average selling price for the calves was $9.60, thus netting $3.87 a calf above the value of the milk consumed.

Dairymen in Fresno County who raised veal valves fed them for from three to seven weeks upon a diet of whole milk. On an average, each calf utilized 58.4 gallons of whole milk containing 17.8 pounds of butterfat, worth at the prevailing market $11.12. The average selling price of calves was $7.50, so that the average calf in this district failed by $3.62 of paying for the feed that it consumed.

In the Monterey-San Benito-Santa Cruz district, dairymen had the choice of selling many of their calves for from $4.00 to $6.00 when four or five days old or else for an average of $9.04 when three or four weeks old after either feeding them by hand or allowing them to run with the cows. When the longer feeding period was used, the calves consumed an average of 42 gallons of milk, having a market value of $7.60. Long-time feeding, therefore, returned but $1.44 more than the cost of feed, as against a return of $4.00 to $6.00 for a few-days-old calf.

Other districts are not discussed because in several of them the dairymen dispose of any calves possessing a value at the time that the cow's milk can be used for human consumption, or else the calves are killed when they are born because of the lack of any kind of market. Vealing few-days-old calves was found to be the rule in the Alameda-Contra Costa-Santa Clara and the Los Angeles-Orange districts. While a little selling of new-born calves was practiced in San Diego County, a large number of calves were killed because feeding was deemed to be prohibitive. Discarding calves was the rule in Humboldt County.

Factors to be taken into account in determining the best practice to be used in connection with calves are: Value of calf at time when the dam's milk can be used for human consumption, prices received

for veal at end of colostrum period and later, length of time that calf is kept on whole milk, possibility of substituting skimmilk in whole or in part during the feeding period, market value of the milk and butterfat consumed, gain of calf during the feeding period, and suitability of the breed for vealing.

In some districts, it was evident that more attention to the raising of calves for addition to the milking herds of other sections might well receive attention, as, for example, in San Luis Obispo County, where the existing conditions of feed, labor, market price, and available facilities are favorable. Raising of calves from suitable stock for sale to dairymen operating under conditions which prohibit the rearing of their cows has possibilities not only as a side line but as a possibility for actually replacing some of the present dairying activities.

VALUE OF MANURE PRODUCED BY THE MILKING HERDS

From the figures showing dairymen's estimates of what they considered the manure produced by their milking herds to be worth to them, it is evident that many dairymen are either hazy concerning the amount of credit which should be allowed for this by-product, or else are misinformed as to the actual value that manure has in connection with maintaining the crop producing power of land.

In table 35 is shown the average value of manure per cow made up from dairymen's estimates in each district. The range in value is considerable and partly traceable to varying market demands according to location. For example, the citrus and truck growers of southern California provide a market that is reflected in the estimates of the dairymen supplying manure to these growers, a condition that does not hold in many sections, such as Humboldt, Marin-Sonoma and San Luis Obispo districts.

TABLE 35

Showing Dairymen's Estimates of the Average Annual Value per Animal for Manure Produced

District	Value per Head for Manure Produced by Dairy Animals
Humboldt	$3.37
Marin-Sonoma	1.62
Alameda-Contra Costa-Santa Clara	4.17
Sacramento-Yolo	2.46
San Joaquin-Stanislaus	4.08
Fresno	3.44
Kern	4.20
Los Angeles-Orange	12.54
San Diego	9.18
San Luis Obispo	.33
Monterey-San Benito-Santa Cruz	1.57

When one considers that the average output for a 1000-pound cow during the year amounts to 2.8 tons of urine and 9.88 tons of dung, or a total of 12.68 tons a year, containing 79.22 pounds of potash, 125.21 pounds of nitrogen, and 24.30 pounds of phosphorus, it is reasonable to believe that the value of manure is under-valued. Not all this content can ordinarily be recovered by the dairyman, but only a relatively small proportion need be retained to exceed most of the estimates of worth as shown in the foregoing table. If market values of plant foods are taken at 20 cents a pound for nitrogen, 5 cents for phosphorus, and 4 cents for potash, a year's output to the cow would have a value of $29.43, or $2.28 a ton.

DECREASING MORTALITY

Certain losses among the dairy herds were reported which suggest that there is opportunity for some attention to this phase of dairy management looking to the lessening of mortality from avoidable causes. A number of animals were recorded as having died because of bloat or from swallowing bits of baling wire. Possible losses from bloating may be reduced or avoided by following the practice of certain dairymen who keep their losses at a very low figure by holding the cows in corrals until the dew is off the feed, by giving dry roughage such as straw before turning the cows out, by accustoming the cows to new feeds gradually, and by not pasturing them when the feed is frosty. Careful watch for possible bloating is likewise maintained by these dairymen and prompt measures taken to relieve animals in distress.

The use of a pair of pliers in opening hay bales instead of hacking with a hatchet does away with the danger of cutting off short bits of wire which may be swallowed by the cow and cause internal complications.

An elementary knowledge of veterinary science would be an advantage to all dairymen. Early treatment of minor ailments will not only reduce mortality but also the expense incidental to hiring small jobs done.

Recognition of troubles which may ultimately prove disastrous and prompt disposal of animals when they still possess a meat value are means of increasing the profitableness of the dairy on some farms.

SUMMARY

The cost of producing whole milk and butterfat on 246 California dairies in 11 districts, studied during 1922, was found to be as follows: Humboldt-Del Norte district, $2.73 per 100 pounds of whole milk or 61.2 cents a pound of butterfat in the Arcata district and $2.41 per 100 pounds of whole milk or 54.5 cents per pound of butterfat; Marin-Sonoma district, 49.2 cents a pound of butterfat; Alameda-Contra Costa-Santa Clara district, $2.83 per 100 pounds of whole milk (24.4 cents a gallon); Sacramento-Yolo district, $2.46 per 100 pounds of whole milk or 64.2 cents a pound of butterfat; San Joaquin-Stanislaus district, $2.63 per 100 pounds of whole milk or 60 cents a pound of butterfat; Fresno district, $2.34 per 100 pounds of whole milk or 60.2 cents a pound of butter; Kern district, $2.23 per 100 pounds of whole milk or 50.1 cents a pound of butterfat; Los Angeles-Orange district, $3.73 per 100 pounds of whole milk or at the rate of 97 cents a pound of butterfat contained in whole milk; San Diego district, $3.67 per 100 pounds of whole milk or at the rate of 86 cents a pound of butterfat contained in whole milk; San Luis Obispo district, 53.6 cents a pound of butterfat; Monterey-San Benito-Santa Cruz district, $2.54 cents per 100 pounds of whole milk or 70 cents a pound of butterfat.

During the period of the study, manual labor costs by district averages ranged from 24.1 to 38.2 cents an hour; management from 8.4 to 39 per cent of the sums spent for manual labor; horse labor costs from 8.0 to 21.9 cents an hour; truck and automobile use from 4.8 to 12.5 cents a mile; pasture from $2.68 to $23.16 a cow a year; hay from $12.05 to $23.59 per ton; concentrates from $26.09 to $42.67; silage from $4.81 to $7.86; and green feed from $3.10 to $6.42 per ton.

Part III records the unit factor findings of the amounts of the different items which together make up the cost of producing whole milk and butterfat.

Ways of increasing profits suggested by the study are greater economy in the use of labor and feed, elimination of calf feeding, more efficient use of manure, and more definite attempts to reduce mortality.

The number of dairies in each district from which complete and usable cost data were obtained were as follows: Humboldt-Del Norte, 25; Marin-Sonoma, 19; Alameda-Contra Costa-Santa Clara, 20; Sac-

ramento-Yolo, 41; San Joaquin-Stanislaus, 17; Fresno, 17; Kern, 15; Los Angeles-Orange, 40; San Diego, 13; San Luis Obispo, 20; Monterey-San Benito-Santa Cruz, 19.

On the basis of the dairies studied in each district, the findings indicate that of the total output the proportion produced at a cost equal to or below the average price received during the year, by districts, amounted as follows: Humboldt-Del Norte, vicinity of Arcata, none, Orick-Requa, 16.4 per cent of butterfat and 15.3 per cent of whole milk; Marin-Sonoma, 41 per cent of butterfat; Alameda-Contra Costa-Santa Clara, 30 per cent of whole milk; Sacramento-Yolo, 8 per cent of butterfat and 24 per cent of whole milk; San Joaquin-Stanislaus, 44 per cent of milk; Fresno, 50.8 per cent of butterfat and 55.6 per cent of whole milk; Kern, 70 per cent of butterfat and 74 per cent of whole milk; Los Angeles-Orange, 34.1 per cent of milk; San Diego 62.2 per cent of milk; San Luis Obispo, 40 per cent of butterfat; Monterey-San Benito-Santa Cruz, 10 per cent of both butterfat and whole milk.

Of the various items making up gross cost of production, labor and feed are most important. Percentages for each of these items and the total of the two were found to be for the various districts as follows: Humboldt-Del Norte, labor 31.2, feed 54.5, total 85.7 per cent; Marin-Sonoma, labor 24.8, feed 53.3, total 78.1 per cent; Alameda-Contra Costa-Santa Clara, labor 29.4, feed 45.5, total 74.9 per cent; Sacramento-Yolo, labor 28.6, feed 47.2, total 75.8 per cent; San Joaquin-Stanislaus, labor 31.5, feed 42.0, total 73.5 per cent; Fresno, labor 30.0, feed 45.9, total 75.9 per cent; Kern, labor 30.4, feed 52.0, total 82.4 per cent; Los Angeles-Orange, labor 20.9, feed 56.5, total 77.4 per cent; San Diego, labor 26.7, feed 51.8, total 78.5 per cent; San Luis Obispo, labor 37.4, feed 43.5, total 80.9 per cent; Monterey-San Benito-Santa Cruz, labor 29.3, feed 53.1, total 82.4 per cent.

Of the total output of these dairies, the amount sold by each group ranged from 83.1 to 97 per cent, the remainder being retained at the dairy for feeding of calves or for family or employees' use. Averages for eight of the eleven districts show that between 91.7 and 94 per cent of the output was sold. One district, Los Angeles-Orange, sold more than 94 per cent, the figure for this district being 97 per cent, while two districts recorded less than 91.7 per cent sold, these being Fresno with 83.1 per cent and San Diego with 88 per cent.

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